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VOLUME II: RESULTS OF SECOND ROUND PSL AND TL TRIALS SEPTEMBER 2006

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RESULTS OF SECOND ROUND PSL AND TL TRIALS SEPTEMBER 2006

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SUMMARY

This report summarises the results from Round 2 in which participants used the BS EN 13751:2002 photostimulated luminescence (PSL) method and the BS EN1788:2001 thermoluminescence (TL) method. Recognising the fundamentally qualitative nature of irradiation testing methods and the need to examine the relationship between underlying quantitative data and their associated qualitative outcomes led to a trial which attempts to utilise large numbers of test materials and large numbers of participants.

In this round, 33 test materials of herbs, spices, seasonings and dietary supplement ingredients were prepared in both irradiated and unirradiated forms and in addition, 6 products were selected for blending. The total number of samples distributed to each participant was 72. The selection aimed to include a range of sensitivities (from low to high), which together with 3 different blend concentrations would test proficiency at the limits of the method.

30 participating laboratories conducted PSL determinations and measurements from standard materials and returned results to the SUERC; 12 also carried out calibrated PSL. A further 15 laboratories participated in TL separations and measurements from a subset of 18 samples comprising 6 products presented in unirradiated, irradiated and blended forms.

Reference data for the PSL screening part of the study comprised values determined during round 1, supplemented with an additional 60 PSL determinations from the 6 blended products. Additional PSL screening from each product was also conducted during the blending process. For calibrated PSL analyses all 98 of the original samples used in round 1, plus the 6 blends were re-irradiated, with 10 fold replication, and then measured to determine the calibrated PSL response. Thus an additional 1040 PSL reference analyses were conducted in support of round 2. For the 18 TL samples 20 separations per sample were performed, followed by TL analysis, comprising 360 single aliquot TL determinations, equivalent to 180 EN1788 duplicated analyses. The reference analyses are documented in this report and used, where appropriate, to define assigned values for z score determination.

Participants returned results for PSL screening, calibrated PSL and TL analyses in a timely manner. The PSL screening results once again produced high quality results. Overall 99.9% of irradiated samples were successfully screened into intermediate and positive bands. Only 2.3% of the unirradiated samples screened into positive bands, representing a slight improvement in comparison with round 1. The blended mixtures produced intermediate or positive results in 95.8% of the cases containing 10% irradiated material, in 80.8% of samples with 1% irradiated material and in 37.5% of cases with 0.1% concentrations. Quantitative analyses based on z scores again were able to reveal both sample and laboratory specific differences in behaviour. In comparison with round 1 there has been marked improvement in sample handling with reduced levels of evidence for cross contamination of irradiated and unirradiated materials in the testing laboratories. There are still a few laboratories whose performance could be further improved. The identification and remediation of such problems is a significant achievement for PT work of this sort, and underlines its importance.

Calibrated PSL data were returned by 12 laboratories, each of whom succeeded in producing data sets that conformed to EN13751, despite having diverse access to irradiation facilities. There was some evidence, based on these data that x-ray irradiation and commercial gamma irradiation produced a greater spread in participants' data than the use of a LINAC for administering the calibration doses. Further work would be needed to establish whether such observations can be generalised, and to assess the sample-handling components of data scatter. For these samples

qualitative outcomes were not critically dependent on the calibrated response, however these data could now be used to design a more sensitive test of the calibrated system.

For the TL study 15 participants returned data in 241 out of 270 possible analyses, the remainder of determinations failing to produce sufficient minerals to satisfy EN1788. Of these some 92.6% of the unirradiated samples, 98.9% of the irradiated samples and 62% of the reported results from blends were correctly classified. A small proportion of unirradiated samples were identified as irradiated or containing irradiated material, from four laboratories. One irradiated sample was not successfully identified in one laboratory. For the blends the highest concentrations (10%) were all correctly identified in participants' results; while at lower concentrations laboratories detection rates for the irradiated component were again reduced. Quantitative analyses were also conducted using z scores on the recorded glow ratios. This appears to be informative and to identify laboratory to laboratory differences, although further work is needed to examine the distribution of the glow ratio variable and to explore other means of distinguishing between the detection conditions of each laboratory, for example by utilising absolute signal levels in comparison with detection limits.

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1. INTRODUCTION

Irradiation is used in many countries for the purposes of shelf life extension, reduction of spoilage and pathogen content, and retardation of ripening and sprouting processes in many different foods. UK[1,2,3,4] and European Regulations[5,6] require both licensing of plant and process and explicit product labelling at all stages of market presentation. However, in the absence of widespread consumer acceptance, there is little evidence of properly labelled products in the UK or in Europe. Several analytical methods for detection of food irradiation have been developed, of which the CEN international standards [7,8,9,10,11,12,13,14,15,16] (i.e. within the UK the BS EN series) based on luminescence are in quite widespread use. Both photostimulated luminescence (PSL) screening and thermoluminescence (TL) analysis were used successfully in the 1996 MAFF survey of undeclared foods[17] and also in the 2001 survey conducted by the Food Standards Agency[18]. These surveys have been successful in identifying undeclared irradiated spices and shellfish and particularly in drawing attention to the significant problems associated with dietary supplements[19], which are the subject of current enforcement actions in the UK, and elsewhere in Europe. With this in mind the Food Standards Agency commissioned this project to assess the feasibility of developing a proficiency scheme appropriate for the detection of irradiated foods.

International Harmonised Protocols for conducting proficiency testing of analytical methods and laboratories are available[20,21], and form the basis for schemes such as those operated by

[1] Food (Control of Irradiation) Regulations, 1990, SI 2490

[2] The Food Irradiation Provisions (England) Regulations 2000, 2000,SI 2254

[3] The Food Irradiation Provisions (Wales) Regulations 2001, 2001, WSI 1232 (W.66)

[4] The Food Irradiation Provisions (Scotland) Regulations 2000, 2000, SSI 309

[5] European Directive 1999/2/EC, On approximation of the laws of the Member States concerning foods and food ingredients treated with Ionising Radiation, OJEC, February 1999

[6] European Directive 1999/3/EC, On the establishment of a community list of foods and food ingredients treated with ionising radiation, OJEC, February 1999

[7] BS EN 1784:1996 Foodstuffs - Detection of Irradiated Food Containing fat – Gas Chromatographic Analysis of Hydrocarbons

[8] BS EN 1785:1996 Foodstuffs - Detection of Irradiated Food Containing fat – Gas Chromatographic/Mass Spectrometric Analysis of Alkylcycclobutanones

[9] BS EN 1786:1996 Foodstuffs - Detection of Irradiated Food Containing Bone – Method by ESR Spectroscopy

[10] BS EN 1787:2000 Foodstuffs - Detection of Irradiated Food Containing Cellulose by ESR Spectroscopy

[11] BS EN 13708:2001 Foodstuffs - Detection of Irradiated Food Containing Crystalline Sugar by ESR Spectroscopy

[12] BS EN 13783:2001 Foodstuffs - Detection of Irradiated Using Direct Epifluorescent Filter technique/Aerobic Plate count (DEFT/APC) – Screening Method

[13] BS EN 13784:2001 Foodstuffs - DNA Comet Assay for the Detection of Irradiated Foodstuffs – Screening method

[14] BS EN 1788:1997 Foodstuffs - Detection of Irradiated Food From Which Silicate Minerals can be Isolated: Method by Thermoluminescence

[15] BS EN 13751:2000 Foodstuffs - Detection of Irradiated Food Using Photostimulated Luminescence

[16] BS EN 14569:2004 Foodstuffs – Microbiological Screening for Irradiated Food Using LAL/GNB Procedures.

[17] MAFF, 1997, Undeclared Irradiation of Foodstuffs Surveillance Exercise, Food Surveillance Information Sheet, 102

[18] Food Standards Agency 2002, Survey for Irradiated Foods – Herbs and Spices, Dietary Supplements and Prawns and Shrimps, Food Survey Information Sheet 25/02

[19] European Commission, 2002, Report from the Commission on Food Irradiation for the period September 2000 to December 2001, OJEC, 255,2-12

[20] Thompson M., and Wood R, 1993,The International Harmonised Protocol for the Proficiency Testing of (Chemical) Analytical Laboratories, IUPAC/ISO/AOAC Protocol for Proficiency Testing, IUPAC, Geneva

FAPAS® and others for quantitative analysis of foods. However as noted in the earlier report on the first PT trial round [22] there are methodological questions concerning the adaptation of quantitative PT approaches to the qualitative criteria of irradiation tests.

In the first round[22], 32 PSL screening laboratories examined 49 samples presented as irradiated and unirradiated pairs. Reference analyses were conducted at SUERC and used to define standard values for evaluation of z scores from participants' data. These were compared with qualitative classifications and it was shown that PSL screening outcomes were closely related to z score performance. Some performance differences between laboratories were noted, and suggestions made for enhancing sample handling integrity in the second round. In discussion with participants it was also agreed to use replicate samples in future rounds to bring the PT protocol into line with routine practice in the laboratories.

In this report the second PT trial round is discussed and results are presented. In addition to continuing to study PSL screening, the second round introduces calibrated PSL measurements and TL analysis. PSL screening was conducted by 29 laboratories, measuring 72 samples comprising 33 irradiated and unirradiated pairs, plus 6 blended mixtures of irradiated and unirradiated products. Calibrated PSL results were returned from the same sample sets by 11 participants. The TL analysis tasks involved measurement of 18 samples comprising irradiated, unirradiated and blended mixtures prepared from 6 products. TL analysis was undertaken by 16 laboratories.

This report outlines the design and preparation of round 2 together with details of the new reference analyses undertaken, mainly for the calibrated PSL and TL stages, and an analysis of participants' results.

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[21] Thompson,M., et al, 2006, The International Harmonized Protocol For The Proficiency Testing Of Analytical Chemistry Laboratories, IUPAC Technical Report, in press

[22] D.C.W. Sanderson, L.A. Carmichael, S. Fisk, P. Key, E.M. Scott And M. Thompson, 2005, Development of Proficiency Testing For Detection Of Irradiated Food. Project E01068: Results Of First Round PSL Trials, SUERC, East Kilbride

2. IMPLEMENTATION OF SECOND ROUND (PSL & TL)

In this section the work undertaken in preparation for round 2 is described. The design and protocols are presented, as are details of the sample preparation and presentation to participants. The samples were selected from materials used in round 1, thus permitting the retention of screening reference data from the earlier round. Blended mixtures were prepared and characterised. Additional reference analyses were undertaken and will be documented in the individual sections dealing with PSL screening, Calibrated PSL and TL.

2.1 Outline of round 2

Round 2 aimed to build on round 1 by repeating the PSL screening measurements on a reduced suite of materials now specifically including blends, with the introduction of duplicate aliquots, and by extending the study to calibrated PSL for those laboratories wishing to undertake such measurements. TL analysis was also introduced with a reduced set of samples, and with the participation of several new laboratories in addition to some round 1 participants who were able to conduct both methods.

2.2 Participants

All PSL round 1 participants indicated that they were willing to proceed to round 2 with a sub-set agreeing to conduct calibrated PSL. Subsequently one laboratory experienced technical problems and had to withdraw. Round 2 also included TL analysis; approximately 20 laboratories were approached and 16 agreed to participate of which 7 were already PSL participants. Two new PSL laboratories and one PSL / TL participant also joined for round 2. The full list of participants is given in Table 2.1 below.

Table 2.1. List of Round 2 Participants and their institutions

Name	Address
Dr Angelo Alberti	Consiglio Nazionale delle Ricerche Instituto per la Sintesi Organica ela Fotoreattivita (ISOF-CNR), Bologna, Italy
Dr Stephan Barth	Federal Research Centre of Nutrition & Food (BfEL), Karlsruhe, Germany
Neil Baumann	McCormicks (UK) Ltd, UK
Dr Rainer Brockmann	Chemisches und Veterinaruntersuchungsamt Ostwestfalen-Lippe CVUA OWL, Bielefield, Germany
Peter Brown	Lincolne Sutton & Wood Ltd, UK
Songphop Buranasilp	Thai President Foods Public Company Limited, Thailand
Joanne Chan Sheot Harn	Centre for Analytical Science, Health Sciences Authority, Singapore
Rupa Das	BI Nutraceuticals, USA
Frank Dittmar	Landesbetrieb Hessisches Landeslabor, Kassel, Germany
Dr Claudius Gemperle	Kantonales Labor, Aarau, Switzerland
Jo Jung Heon	Nong Shim Co.Ltd, Korea
Christina Kay	Manhattan Drug Company Inc, USA
Dr Caroline Lardner	Public Analyst Laboratory (Galway), Eire
Stuart MacFarlane	East Anglian Food Ingredients Ltd, UK
Keith McKay	Glasgow Scientific Services, UK
Esko Niemi	Finnish Customs Laboratory, Finland
Dr Sandro Onori	Instituto Superiore di Sanita, Rome, Italy
Dr Juergen Pfordt	LAVES - Lebensmittelinstitut Oldenburg
Mike Pugh	British Pepper and Spice Co, Ltd, UK
Dr Nicola Sardone	Indena SpA, Settala, Italy
In-Sang Song	TaeKyung NongSan Co Ltd, Korea
Irene Straub	Chemisches- und Veterinaruntersuchungsamt, Karlsruhe, Germany
Setsuko Todoriki	National Food Research Institute, Japan
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Kang Woo Suk	Nong Shim Company, Korea
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Andy Ward	Unilever UK Foods, Purfleet, Essex
Margaret O'Sullivan	Public Analyst Laboratory (Cork), Eire
Irene Poulima	Food Division Laboratory, General Chemical State Laboratory of Greece
Michael Baden	Eurofins Scientific Group, Hamburg, Germany
Wolfgang Kruspe	Thuringer Landesamt fur Lebensmittelsicherheit und Verbraucherschutz (TLLV)
Christine Schleich	Landersuntersuchungsamt, Institut fur Lebensmittelchemie und Arzneimittlprufung Mainz
Jurgen Brunner	LUA Sachsen
Beate Muller	Landeslabor Brandenburg, Standort Frankfurt (Oder) Fachgebiet L4, Labor Bestrahite Lebensmittel
Brigitte Butz	Bayerisches Landesamt fur Gesundheit und Lebensmittelsicherheit
Maria Iglovari	Laboratory of Foodstuffs and Chemicals, Budapest, Hungary

2.3 Test Material Preparation and Handling

2.3.1 PSL Materials

Having consulted participants from round 1 it was agreed that duplicated screening measurements from a reduced sample set would be utilised for the screening tasks in round 2 and that blended samples would be introduced. Therefore a subset of 33 of the original 49 samples was selected avoiding some of the replicated products and some of the products which had overflowed the instrument counter in irradiated form. 50 pots of each of these samples were sent to Isotron plc and irradiated to a mean dose of 4.6 (±0.1) kGy on 27 March 2006.

The sample allocation comprised all 33 products in irradiated and unirradiated forms, plus 6 blended products (which were also used in the TL study under different labels), making a total of 72 samples. Since the products had already been measured in the presentational order of round 1, it was decided to present them in a random order. After considering alternatives it was decided to use a single random sequence for all laboratories (Table D.2 in Appendix D). Participants were informed that the samples were in random sequence, but were not informed which samples from round 1 had been selected or their order of presentation.

The 6 products selected for blending aimed to include a range of sensitivities (from low to high), products (2 herbs, 2 spices and 2 dietary supplement matrices were used), and concentrations levels (10%, 1% and 0.1% irradiated material). The blending process is described below.

Table 2.2 lists the products used in round 2. Blends were produced from SP8531 (Ginger 10% irradiated), SP8533 (Rosemary 1% irradiated), SP8535 (Chilli powder 0.1% irradiated), SP9539 (Tarragon 10% irradiated), SP8577 (Siberian Ginseng 1% irradiated) and SP8578 (Green Tea 0.1%).

Table 2.2. Round 2 Test Materials List

Test Material No.	Product Description	Abbreviation	SUERC Ref No	Suppliers Code
1	Basil	Basil	SP8512	Not supplied
2	Curry Powder No 3	CP3	SP8513	Not supplied
3	Barbeque Seasoning	BBQ	SP8514	Not supplied
4	Ground Cinnamon	Cinn	SP8515	Not supplied
5	Paprika	Pap	SP8516	Not supplied
6	Ground Cumin	Cum	SP8517	Not supplied
7	Oregano	Oreg	SP8518	Not supplied
8	Ground Black Pepper	GBP	SP8519	Not supplied
9	Chives	Chives	SP8520	Not supplied
10	Mint	Mint	SP8521	Not supplied
11	Sage	Sage	SP8523	Not supplied
12	Ground Mixed Spice	GMS	SP8525	Not supplied
13	Ground Coriander	Cori	SP8526	Not supplied
14	Medium Curry Powder	MCP	SP8528	Not supplied
15	Ground Nutmeg	Nut	SP8529	Not supplied
16	Whole Black Pepper	WBP	SP8530	Not supplied
17	Ground Ginger	Ginger	SP8531	Not supplied
18	Thyme	Thyme	SP8532	Not supplied
19	Rosemary	Rose	SP8533	Not supplied
20	Turmeric	Turm	SP8534	Not supplied
21	Chilli Powder	Chilli	SP8535	Not supplied
22	Garlic Powder (Chinese)	Gar	SP8536	Not supplied
23	Parsley	Pars	SP8538	Not supplied

24	Tarragon	Tar	SP8539	Not supplied
25	Milk Thistle Seed Powder	MTSP	SP8571	P13225 Batch 041104
26	Alfalfa Herb Fine Powder	AHFP	SP8572	P01102 Batch 4978
27	Saw Palmetto Berry Fine Powder	SPBFP	SP8573	P1906 Batch 031103
28	Dong Quai Root Powder	DQRP	SP8574	P04083 Batch 031209
29	Guarana Seed Powder	GSP	SP8575	P07385 Batch 7781
30	Powdered Gingko biloba Leaves	GBL	SP8576	P0711 Batch 1518
31	Siberian Ginseng Root Powder	SGRP	SP8577	P0714 Batch 040206
32	Green Tea Powder	GTP	SP8578	P07358 Batch 040419
33	Echinacea Powder	EP	SP8579	P05005 Batch 101673

To double-randomise the material for distribution, the PSL pots were arranged in numerical order according to the random number allocated in Round 1 (e.g. 208) and then paired with a new random number from a freshly generated list, placed in this new order and allocated a random laboratory destination on the basis of this number. The allocation is tabulated in Appendix D below.

2.3.2 TL Materials

TL laboratories were consulted at the outset to determine an approximate number of samples which could be considered practicable for the trial, bearing in mind that the sample preparation and handling for TL analysis is substantially more laborious than PSL analysis. On this basis it was decided to present 18 samples to the TL laboratories, comprising the 6 products described above, prepared in unirradiated, irradiated and blended forms. Once again a fixed allocation sequence was used (table 2.5 below) which was not communicated to participants in advance.

The TL samples were all re-potted so that the blends had the same appearance to participants as the end member samples for each product. For those laboratories participating both in PSL and TL stages the blends appeared twice, in both sample sets. Two PSL participants joined the TL trial after the products had been dispatched. Since very limited quantities of the TL blends remained at that stage it was decided to re-use remaining portions of the PSL samples as TL samples for these two participants. The correspondence between the PSL and TL sample codes was therefore revealed to these two laboratories after they had completed their PSL analysis.

TL laboratories also received two irradiated LiF chips, to provide temperature calibration checks on the TL readers used in the study. 50 LiF chips were subjected to the following pre-characterisation steps. Firstly, all the dosimeters were irradiated to a 100mGy dose, pre-heated for 5 minutes at 90°C and then read out in a Riso DA15 TL reader from 0-400°C at $5°Cs^{-1}$ to precondition them and check for batch uniformity. The chips were then annealed at 400°C for 60 minutes, irradiated again to 100 mGy, annealed again at 90°C for 30 minutes and packed into laboratory sets for distribution. The dose was selected to remain within the linear range of output for LiF. Thermal processing was conducted in an external muffle furnace with temperature logging during annealing.

2.3.3 Blending

Initially, 10 aliquots of the recently irradiated portion of each of the 6 chosen products were dispensed into petri dishes and 60s PSL screening measurements conducted. These are

tabulated below, together with results for the same products from the Round 1 reference measurements, enabling comparison between the 2 irradiations:

Product	Ginger SP8531	Rosemary SP8533	Chilli SP8535	Tarragon SP8539	Ginseng SP8577	Green Tea SP8578
Aliquot						
1	297286	78706	133300	48723	1291448	117128
2	243906	71226	140675	36385	1126778	110876
3	407599	80194	134466	30577	1289684	125699
4	648877	78897	162891	26768	989735	112917
5	308605	80507	178017	73402	1262244	116855
6	385120	54319	145837	55013	1099444	118582
7	285810	71209	115018	94350	1135077	107604
8	225466	76635	124421	25738	1030373	94960
9	459122	85925	164007	22984	1159521	114507
10	384922	86673	156297	55672	958185	141958
Mean	364671	76429	145493	46961	1134249	116109
SD	124825	9312	19682	23338	120108	12145
SE	39473	2945	6224	7380	37982	3841
CV	34	12	14	50	11	10
R1 mean	319085	68466	132939	45325	917869	103468
R1SD	102844	4944	27094	68201	88866	28037
R1 CV	32	7	20	150	10	27

Table 2.3. PSL screening of 10 aliquots of each product prior to blending

On the basis of these data, the concentration of blend chosen for each product was as follows:

Product	Concentration	Expected mean PSL
Ginger SP8531	10%	36467
Rosemary SP8533	1%	764
Chilli powder SP8535	0.1%	145
Tarragon SP8539	10%	4696
Ginseng SP8577	1%	11342
Green Tea SP8578	0.1%	116

Table 2.4. Blend concentrations and predicted mean PSL estimate

Also tabulated are the expected mean PSL terminal counts, based on a simple multiplication of the mean of the 10 test screenings of the spike material and the concentration used.

2.3.3.1 Mixing process

Taking each product in turn, starting with the lowest (0.1%) spike concentration, and working with one product at a time, the mixing was performed as follows. To provide the unirradiated portion of the blend, pots 181-200 (as defined prior to round 1) of each product were mixed together and weighed. If insufficient material was available, further pots in the range 95-100, left over from Round 1, were included until the desired weight was reached (499.5g for 0.1%, 495g for 1% and 450g for 10%) to achieve a total weight of blended product of 500g. Full details of the mixing process, which involved sub-sampling the mixes in 10 fold replication 6

times during mixing and recording PSL data to judge the homogeneity and extent to which the expected values had been achieved, are included in Appendix E.

Following the blending, samples for TL analysis were allocated numbers cyclically as shown below, and pots were labelled and filled, with 7g per pot. It was noted that this was quite a small amount of material to work with, but it was not possible to provide more.

	U	I	B
Ginger	1	2	3
Rosemary	6	4	5
Chilli	8	9	7
Tarragon	10	11	12
Ginseng	15	13	14
Green tea	17	18	16

Table 2.5. Sample number allocations for blends

2.3.3.2 Homogenising the paprika standard

In Round 1 the spread of results from the participants' screening of the paprika standard was considerable and an attempt was made to reduce this for round 2. 600g of irradiated paprika were mixed together, then blended for 5 minutes with the same equipment as the blind blends, turned with a spoon then blended for a further 5 minutes before 10 aliquots were read out. This cycle was then repeated; the results are as follows:

Cycle	1	2
Aliquot		
1	64361	32076
2	57313	34681
3	43924	55685
4	30249	32568
5	42244	79514
6	37751	71847
7	38817	28091
8	29651	76939
9	35410	34671
10	77161	29606
Mean	45688	47568
SD	15637	21182
CV(%)	34	45

Table 2.6. PSL screening results during paprika homogenisation

It was concluded that mixing made little difference; 35 pots of standard were then dispensed. The last 5 pots also contained paprika which had not been part of the mixing experiment; PSL analysis confirmed that this had no discernible impact.

Sample packs were distributed between 8 and 10 May 2006. The protocol which participants were asked to follow is presented in Appendix A.

3. PSL SCREENING

3.1 PSL Homogeneity testing (blends)

Data from round 1 which had been used to calculate the reference values and z-scores were carried forward into round 2 to perform the same function with the new screening data from participants. It was however necessary to generate new data for the blends, and for the calibrated PSL section of the study described below.

On 20 July 2006, the new blends were screened using the procedure followed for the homogeneity testing performed at SUERC in July and August 2005, but without the intervening measurements of the paprika standard.

Ten aliquots of the irradiated paprika reference standard were also measured to repeat instrument comparisons undertaken in Round 1. Prior to measurement the material had been homogenised, so the measurements were also used to assess the efficiency of the mixing process.

3.2 PSL Homogeneity results (blends and paprika)

The full results from the blends are tabulated in Appendix B. Table 3.1 presents the reference values calculated from these data.

	Linear				Log			
	Mean	SD	SE	CV	Mean	SD	SE	CV
SP8351	21015.4	15521.63	4908.371	73.86%	4.241665	0.259966	0.082208	6.13%
SP8533	691.4	500.9658	158.4193	72.46%	2.768233	0.246304	0.077888	8.90%
SP8535	931.6	1059.578	335.0679	113.74%	2.843079	0.292019	0.092345	10.27%
SP8539	5148.143	2754.43	871.0273	53.50%	3.453039	0.27816	0.087962	8.06%
SP8577	10073.7	3606.483	1140.47	35.80%	3.979467	0.150172	0.047488	3.77%
SP8578	484.8	108.7114	34.37758	22.42%	2.675532	0.099058	0.031325	3.70%

Table 3.1. Reference values for the blended materials (screening)

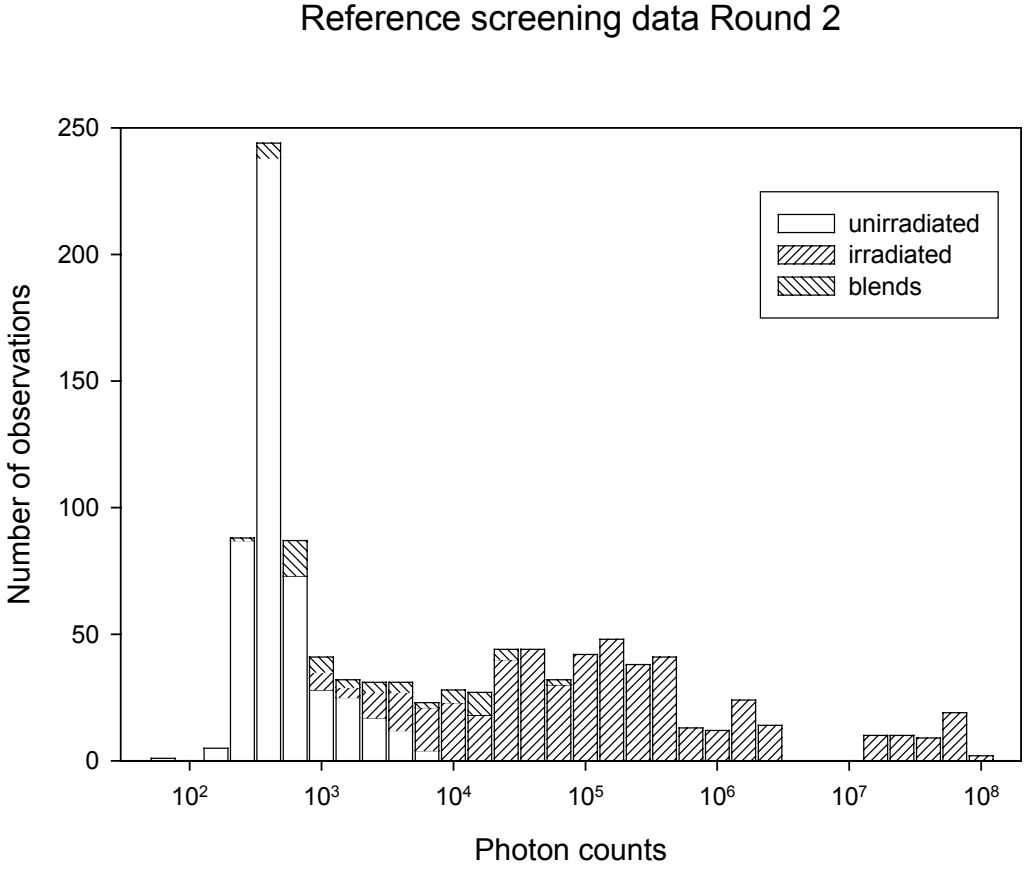


Figure 3.1 Histogram of reference data to show position of blends

Results for the round 2 measurements of the paprika standard are tabulated below.

Paprika Test Material	Terminal Counts
1	64361
2	57313
3	43924
4	30249
5	42244
6	37751
7	38817
8	29651
9	35410
10	77161
Mean	45688
SD	15637
CV(%)	34

Table 3.2. Results of 10 replicate measurements from the paprika reference material, measured by SUERC.

3.3 Participants' Results

30 participants submitted PSL screening results. Participants were asked to return their PSL terminal counts and classifications for each of the pair of replicates used, plus an overall evaluation, and to return copies of summary and raw data files created by the instrument for possible audit purposes. In all cases the completed spreadsheets with terminal counts and individual classifications were returned. Not all participants supplied primary data however, and few utilised the duplicated readings to form a final evaluation.

3.3.1 The paprika standard

Participants also returned data from the irradiated paprika reference standard. The means, standard deviations and standard errors are tabulated in Table 3.3 and provide another assessment of the relative sensitivity of each instrument to this material and the variation from round 1.

Lab	Mean	SD	SE
1	42168	14416	4559
2	28778	21696	6861
3	62103	18360	5806
5	90382	26901	8507
6	61277	15860	5015
8	56797	11612	3672
9	62871	21934	6936
11	45860	23096	7304
13	57281	21704	6863
14	45295	20294	6418
16	50322	13450	4253
17	46629	16878	5337
18	53061	16733	5291
19	57171	14653	4634
20	35810	4820	1524
21	55819	17220	5446
22	40082	14358	4541
23	55323	13973	4419
24	65138	27344	8647
25	43101	11990	3792
26	37161	13042	4124
27	24407	7104	2247
28	70393	62679	19821
29	55652	21351	6752
30	34882	9459	2991
31	29275	14383	4548

Table 3.3. Participants' paprika standards – mean, standard deviation and standard error from 10 observations

The relative sensitivities of the instruments have been re-calculated using the round 2 data both for the participants and for the SUERC reference; the participants' instrumental sensitivities are shown in Table 3.4, together with the corresponding values from the first round. In round 2 the overall results appear to be quite similar to those obtained before. The data from round 2 range from 0.53 to 1.98; compared with 0.53 to 1.45, with similar

uncertainties (typically 10-20%) in both cases. The mean sensitivity between those laboratories participating in both rounds is very similar (0.94±0.24 compared with 1.10±0.31). The general similarity seems to imply that, as observed in homogeneity testing, the additional attempts to homogenise the paprika standard have made little difference to outcome, and also it seems that the spread in instrumental performance is comparable over the gap of approximately one year between the two rounds.

	Round 1		Round 2	
Lab	Rel sens.	Error	Rel sens.	Error
1	0.79	0.15	0.92	0.14
2	0.7	0.08	0.63	0.16
3	0.95	0.12	1.36	0.19
5	1.22	0.15	1.98	0.28
6	1.18	0.21	1.34	0.18
8	1.28	0.22	1.24	0.16
9	0.7	0.07	1.38	0.21
11	1.17	0.16	1.00	0.19
13	1.02	0.12	1.25	0.20
14	1.06	0.16	0.99	0.18
16	1.01	0.12	1.10	0.15
17	1.12	0.14	1.02	0.16
18	1.08	0.16	1.16	0.17
19	0.97	0.11	1.25	0.17
20	0.7	0.07	0.78	0.09
21	0.65	0.08	1.22	0.18
22	0.59	0.08	0.88	0.14
23	1.45	0.2	1.21	0.16
24	0.81	0.09	1.43	0.24
25	0.8	0.08	0.94	0.13
26	1.03	0.13	0.81	0.13
27	0.53	0.06	0.53	0.08
28	1.25	0.27	1.54	0.47
29	0.83	0.09	1.22	0.20
30	0.75	0.09	0.76	0.11
31	0.72	0.16	0.64	0.12
Mean	0.94	0.13	1.10	0.18
SD	0.24	0.05	0.31	0.07

Table 3.4 Relativity instrumental sensitivities derived from measurements of the paprika standard (10 each for rounds 1 and 2)

Figures 3.1 and 3.2 show the relationship between the paprika standard results from the two rounds, firstly as raw data and then as relative sensitivities. In both cases there are positive correlations, implying that the laboratories have largely retained the same relative sensitivities between both rounds. Both figures also show the error bars corresponding to the standard errors on the mean counts, which appear to account for much of the dispersion about the trend lines in the data. Regression lines are marked on the figures. The correlation coefficients are equivalent between the two plots (r=0.545 cf r=0.546), confirming that a significant proportion of the variance in sensitivity is reproduced between rounds. It appears also from examination of the error bars that much of the deviation from either the trend lines or lines of

equality through the data is accounted for by the uncertainties of the data, which are driven by the heterogeneity of the paprika. At this stage it is not clear whether the relative sensitivities to all samples are well represented by the paprika data, although it was noted in round 1 that there was a marked correlation between paprika relative sensitivity and the pooled Z scores for irradiated samples.

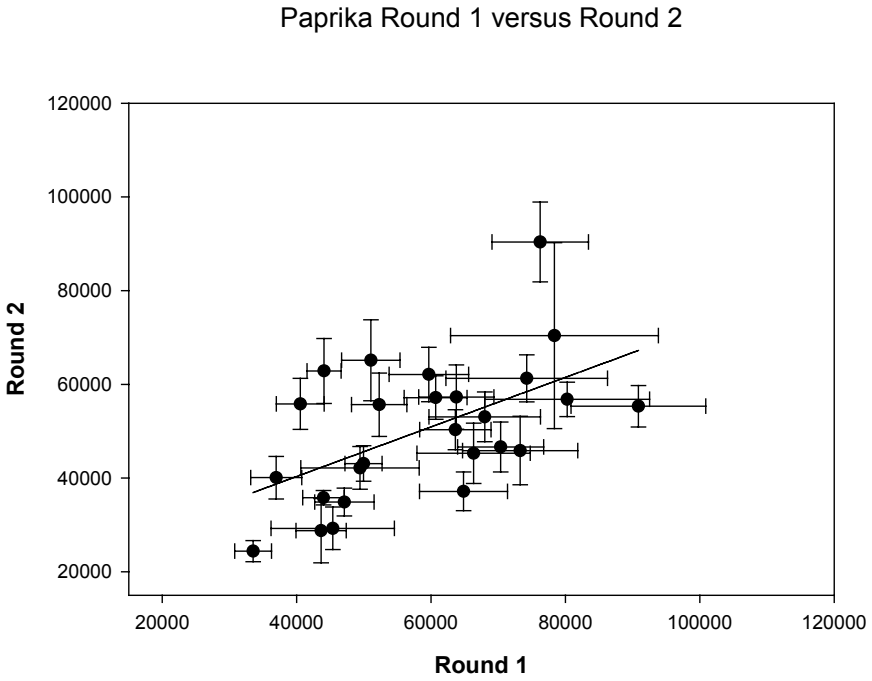


Figure 3.2 Mean paprika signal in photon counts obtained by laboratories in rounds 1 and 2

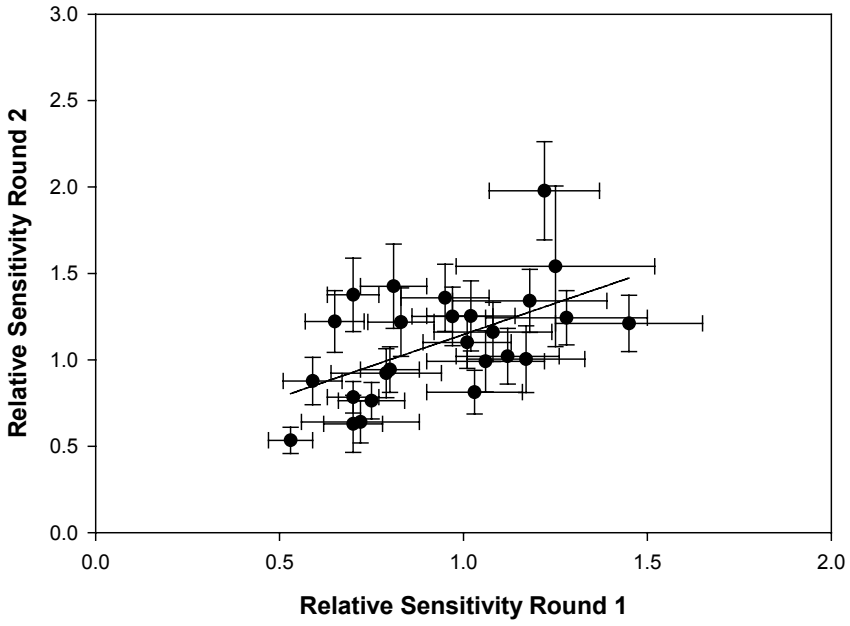


Figure 3.3 Relative instrument sensitivities from measurements of paprika standards in rounds 1 and 2 standardised to SUERC results

3.3.2 Screening results

Raw data, comprising the PSL intensities for each test material and participant, are tabulated in Appendix C. These have been represented graphically in Figure 3.4, which shows all the participants' data by product. Unirradiated samples seem be mostly represented between negative and intermediate bands; irradiated samples again as expected straddle intermediate and positive bands and exhibit marked sample to sample sensitivity variations. The blended samples are generally located between unirradiated and irradiated results, again as expected.

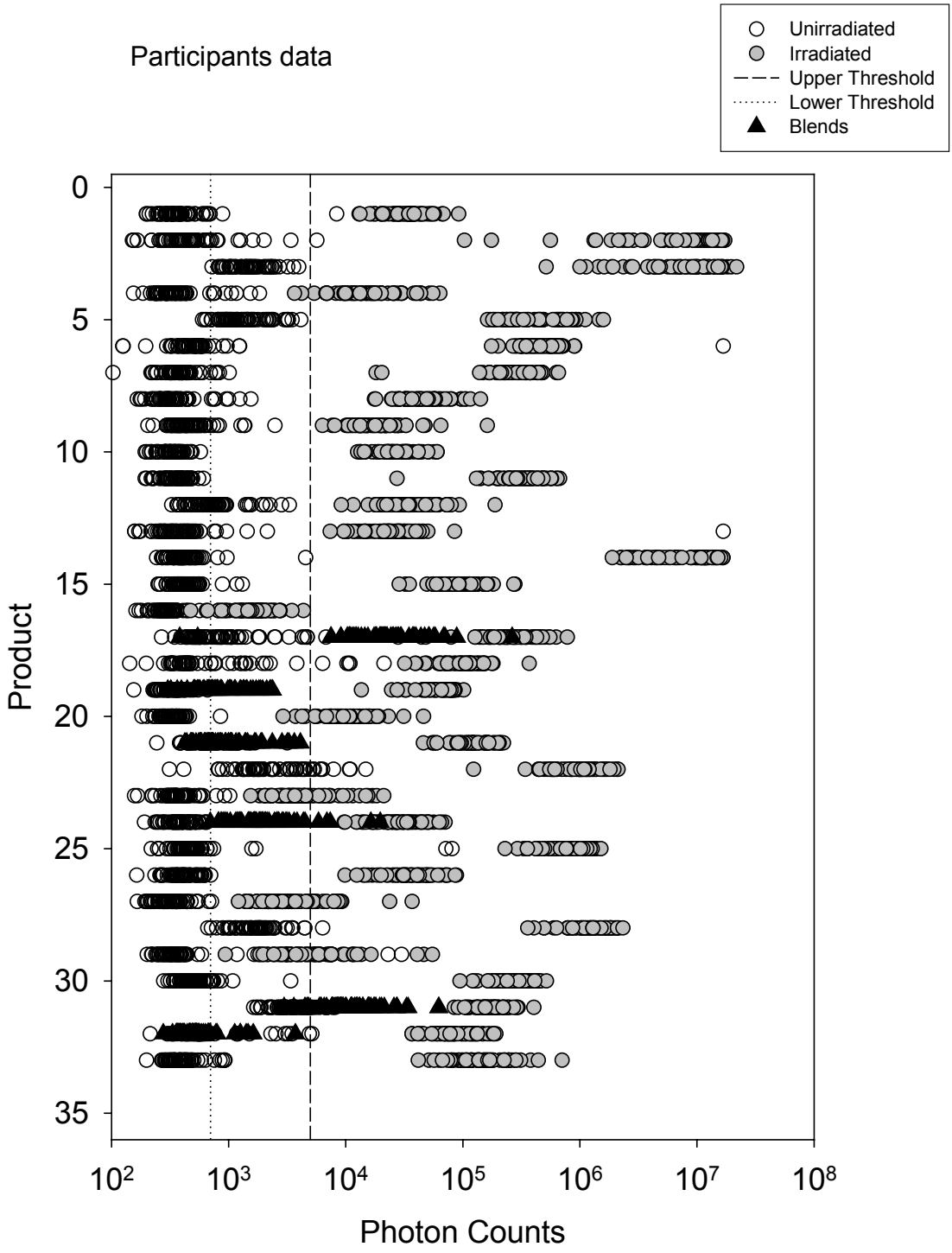


Figure 3.4 Participants' screening data for each product.

Participants' data are also presented as scatter diagrams for each of the categories of sample (irradiated, unirradiated and blended) in Figures 3.4-3.6, arranged by laboratory.

From Figure 3.5 it can be seen that, while there are still some observations from unirradiated materials which are above the upper threshold, this is far less prevalent than in round one. This suggests that sample handling has greatly improved overall. Separation of irradiated and unirradiated samples has also improved as a result. This is reflected in the z scores and qualitative scores discussed below. Examination of the order of presentation of samples, which clearly contributed in round 1 to cross-contamination problems, explains two of the outliers; these two samples were run consecutively and the preceding sample was a high sensitivity irradiated product. It appear that cross-contamination has persisted to a limited extent, but judging by the proportion of unirradiated samples giving positive band results a only minority of laboratories now appear to be experiencing such problems.

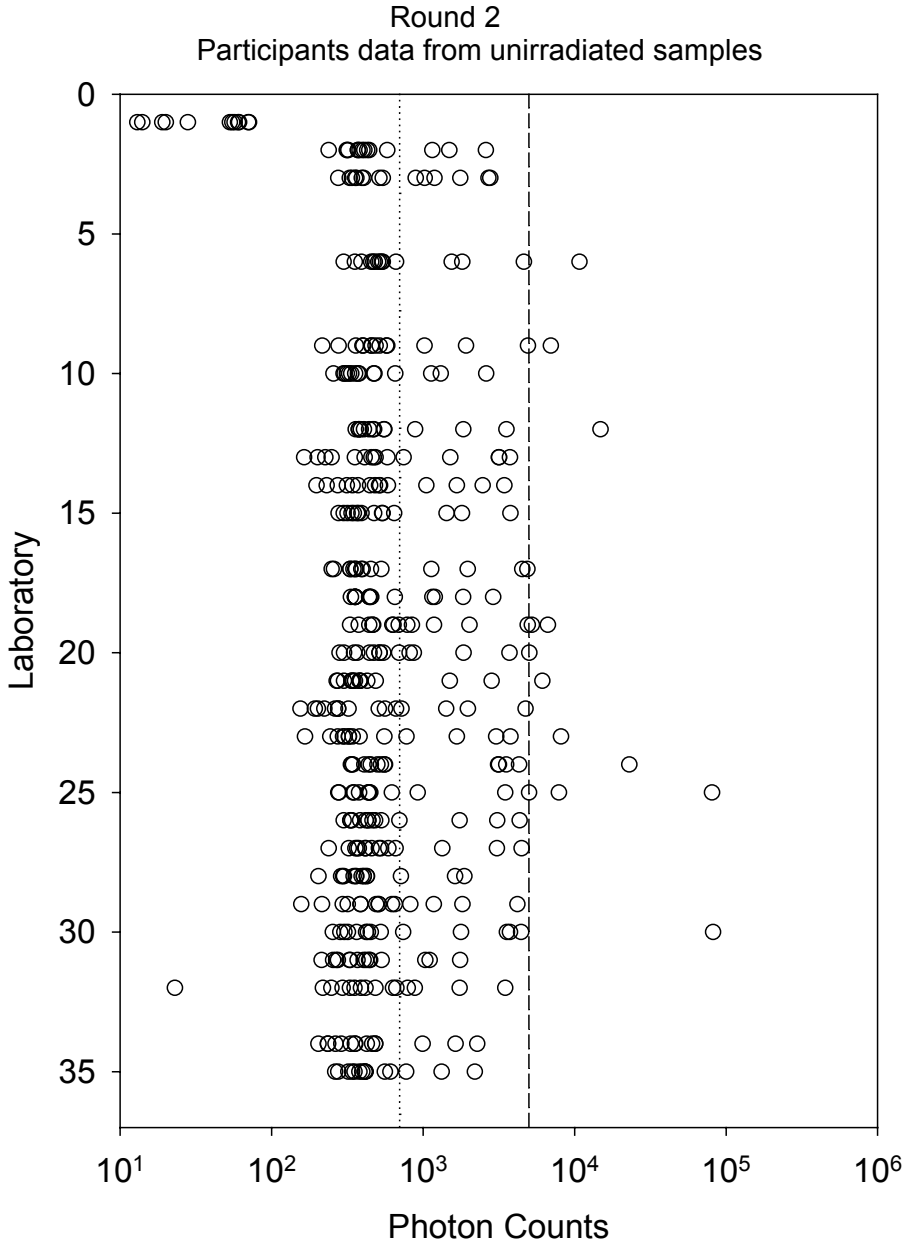


Figure 3.5 Participants' data for unirradiated samples by laboratory

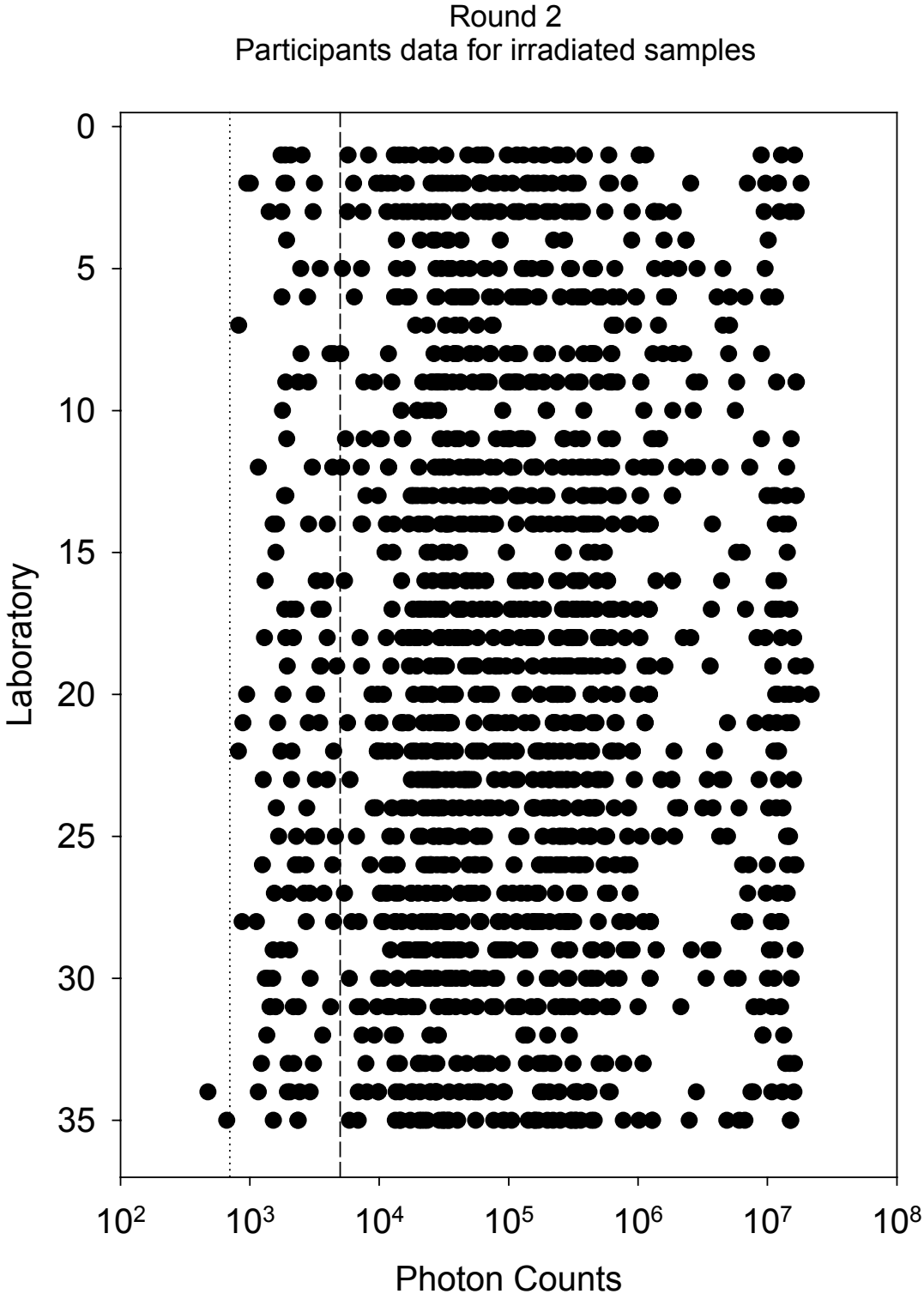


Figure 3.6 Participants' data for irradiated samples by laboratory

When arranged by laboratory the raw data from irradiated samples cover 4-5 orders of magnitude, representing the range of sample sensitivity variation. Laboratory to laboratory sensitivity variations (eg as seen in the paprika) clearly are very small in comparison with the range of variations from sample to sample.

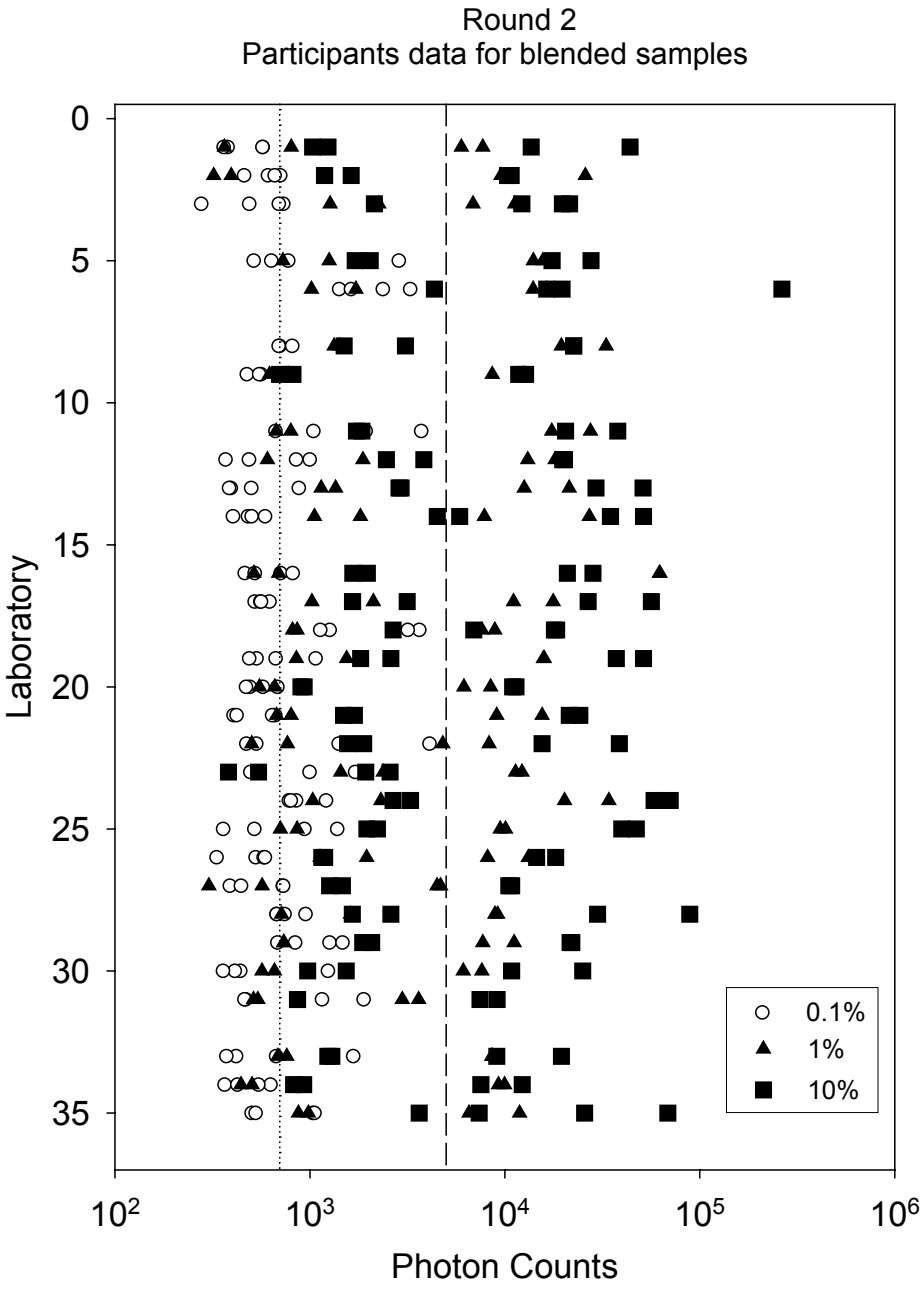


Figure 3.7 Participants' data for blended samples by laboratory and concentration

From Figure 3.6 it can be seen that all but 2 of the results from irradiated samples exceed the lower threshold and that the great majority also exceed the upper threshold. This is consistent with the reference data produced at SUERC.

The results from the blended samples, shown in Figure 3.7, indicate significant dependence between concentration and screening outcome. Interestingly a significant proportion of results at 10% and 1% concentrations fall into the positive screening band, above the upper threshold, with the majority of the remainder in the intermediate band. By contrast none of the 0.1% blends produced terminal counts above the upper threshold, although a significant proportion would apparently be detected above the lower threshold. This confirms the importance of classifying intermediate results as requiring further attention, as recommended by EN13751, particularly for samples with low concentrations of irradiated materials.

Perhaps unsurprisingly the data also show that blends would be missed during routine analysis where concentrations of the irradiated component are low. The upper limit of the range for blends (apart from one outlier all results are below 10^5) is below that for pure irradiated samples ($10^7 - 10^8$).

Figure 3.8 presents all the participants' data as a histogram. It appears that the separation of irradiated and unirradiated samples has improved since round 1, with very few unirradiated examples falling into the positive band. General sample handling, randomised presentation rather than alternating irradiated and unirradiated materials, and corroboration from duplicate aliquots may all have contributed to the observed improvement. The blends, again as observed above, show reduced intensities in comparison with irradiated samples, with some examples reaching the negative bands.

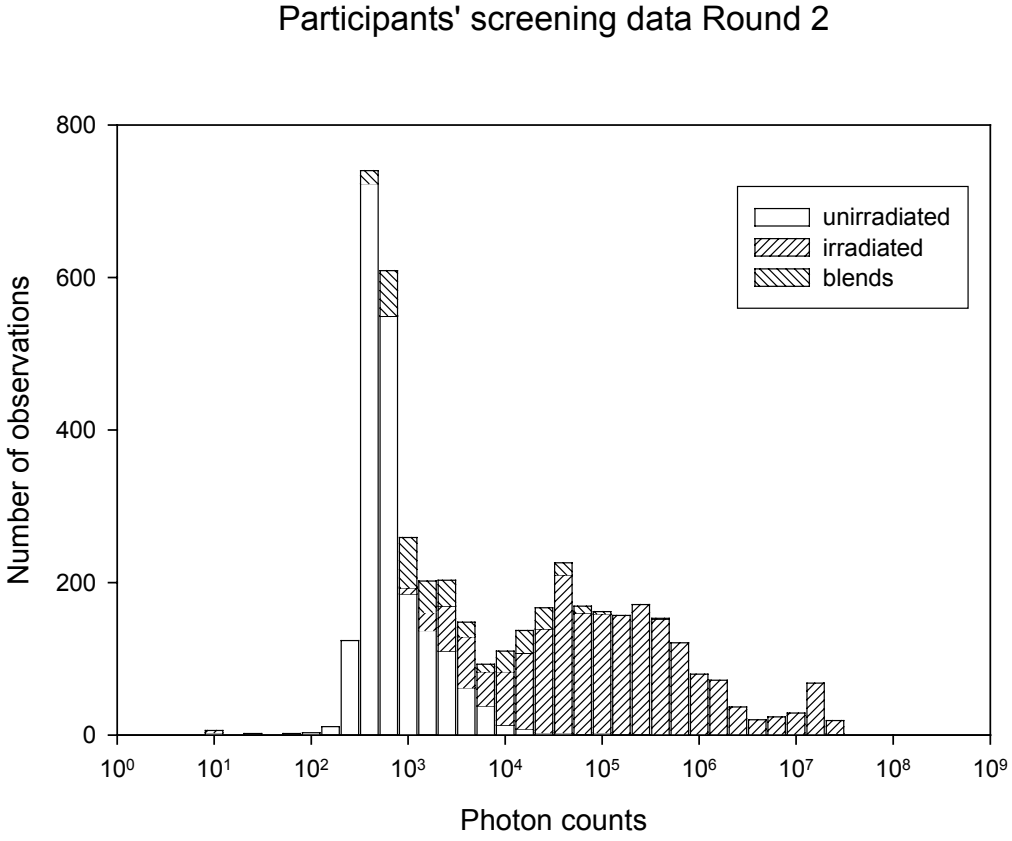


Figure 3.8 Histogram of participants' screening results for all products

3.3.3 Summary Statistics

As described in the Round 1 report (section 2.3), z-scores were calculated for the screening measurements. The same calculations were applied in Round 2, with additional assigned values being derived for the blends.

Z-scores are tabulated below to allow each participant to assess their outcomes on a test material by test material basis. Tables 3.5, 3.6 and 3.7 show Z scores for each unirradiated sample for laboratories 1 to 13, 14 to 25 and 26 to 35 respectively. Similarly tables 3.8, 3.9 and 3.10, present results for irradiated samples and tables 3.11,3.12, and 3.13 for the blends. Graphical representation, which reveals patterns in the data, follows.

Table 3.5 Unirradiated Round 2 Test Materials: *z*-Scores for Participants 1-13

Test Material	Lab 1	Lab 2	Lab 3	Lab 5	Lab 6	Lab 8	Lab 9	Lab 11	Lab 12	Lab 13
1	0.84	-0.17	0.53	2.21	1.57	-0.19	0.66	1.37	-1.60	0.56
	1.39	0.40	-1.94	0.70	-0.03	2.60	0.97	1.50	-0.59	1.24
2	2.52	-0.10	1.33	4.46	11.22	4.23	-2.03	3.87	-0.10	2.35
	2.65	2.53	-1.55	4.21	10.10	2.40	4.45	3.38	3.00	3.03
3	-0.75	-1.39	-0.49	0.56	1.37	0.15	1.62	-0.23	0.50	-0.20
	-1.26	-0.79	0.15	1.84	1.49	0.33	0.68	0.04	1.85	1.29
4	1.50	0.03	0.25	2.58	9.46	-0.56	-0.33	2.06	0.74	-0.23
	-1.54	0.71	-2.44	1.83	8.60	1.65	-0.10	2.25	0.55	1.13
5	0.48	1.08	2.21	4.14	5.43	3.82	2.17	0.94	2.48	5.30
	-0.28	2.07	-0.18	0.16	2.62	0.87	2.96	4.08	2.67	3.40
6	0.36	1.38	1.50	-2.10	4.96	0.35		0.72	0.96	0.92
	1.37	2.36	1.60	1.65	4.02	2.02	-6.56	1.63	-0.09	0.82
7	-1.73	0.99	-2.06	1.52	6.84	2.24	0.06	2.38	1.76	0.45
	-0.46	1.26	0.06	1.88	5.70	-0.01	1.46	1.45	-2.28	2.91
8	-3.07	2.34	-2.66	1.37	12.59	4.01	-2.46	2.73	-1.00	0.05
	1.28	0.18	3.62	-0.01	11.08	2.10	1.22	2.34	-9.64	2.47
9	-0.43	0.88	6.87	-4.45	6.36	4.46	1.37	0.58	1.40	2.57
	4.69	-0.57	-5.51	1.03	5.10	1.37	2.54	5.80	1.59	3.98
10	-1.93	0.57	-0.36	2.09	5.62	-0.42	-2.60	1.96	1.22	2.57
	0.08	-0.24	1.39	0.38	0.78	2.85	0.46	2.27	-0.27	0.38
11	1.53	1.42	1.07	0.71	2.06	1.55	0.44	1.57	1.04	0.28
	0.22	1.25	1.42	-1.41	2.95	-0.24	-0.81	1.57	-0.81	1.22
12	-0.50	0.32	-1.72	-0.34	-0.74	0.44	-0.62	-0.71	1.40	-0.50
	-0.49	-0.60	-0.94	0.83	1.63	-0.36	-0.95	-0.25	-0.29	-0.38
13	1.60	1.63	0.92	-1.70	6.50	-0.01	2.16	1.93	1.36	1.88
	0.25	2.80	1.12	-0.47	4.99	0.22	-0.52	1.06	4.10	0.44
14	-0.71	-0.32	0.55	-1.38	1.10	0.81	-0.68	0.44	-0.20	-0.10
	-0.60	1.40	3.06	-0.19	0.86	0.64	0.73	0.24	-0.44	0.95
15	0.59	0.26	2.59	0.05	1.39	0.40	-0.19	1.27	-0.60	0.26
	-0.71	-0.01	0.60	1.40	1.12	0.72	-0.75	0.31	1.36	0.64
16	0.69	1.35	-4.63	1.38	3.43	1.46	-1.29	1.70	1.40	1.41
	-0.18	1.62	1.23	2.57	2.49	0.78	0.98	1.13	0.37	2.02
17	-0.30	0.90	-0.34	0.16	2.19	0.64	-0.53	0.22	-1.81	0.26
	0.31	0.60	-0.48	-0.62	3.21	0.49	-0.93	0.27	-0.94	1.00
18	0.31	2.48	-4.71	2.07	12.45	3.58	5.22	2.48	0.50	2.78
	0.29	1.36	1.79	1.89	11.53	2.08	5.22	2.86	0.90	5.75
19	0.58	1.61	0.39	0.41	2.24	-0.10	0.39	0.67	3.45	0.67
	0.73	1.18	1.45	5.53	2.63	2.22	1.77	1.86	-1.44	-1.30
20	0.87	0.08	1.70	0.52	2.29	1.04	1.79	0.52	0.45	-1.33
	-1.00	1.44	0.78	1.29	0.97	1.39	1.67	1.37	-1.98	-0.21
21	-0.85	-1.14	0.36	1.59	2.86	1.40	-3.19	0.62	1.65	2.20
	-0.21	-0.62	1.92	3.15	2.31	1.73	0.21	1.25	3.09	1.83
22	-0.89	1.01	-1.53	-0.37	-0.42	0.11	0.76	-0.29	1.64	0.16
	-0.74	-0.43	0.17	2.92	-0.51	1.47	-0.98	3.52	0.66	-0.53
23	-5.12	6.36	-0.61	0.56	1.25	-0.86	-0.82	-0.33	-2.82	1.34
	1.20	7.05	-1.25	1.59	3.52	0.80	-1.23	0.86	0.94	-0.31
24	-2.09	-0.64	-0.72	-1.04	2.08	0.21	-4.84	0.87	-0.31	1.20
	0.36	-0.60	2.05	1.27	3.18	1.04	1.32	-0.02	1.33	-0.31
25	1.44	-0.50	-0.32	1.88	2.44	-0.39	0.37	0.86	0.17	-1.26
	-0.55	-0.30	-0.12	1.01	1.04	1.37	-2.15	0.51	0.33	0.25
26	-0.44	-0.32	2.33	-0.26	3.45	3.18	0.46	-0.44	-2.32	1.44
	-0.17	0.46	-0.71	1.68	4.44	2.94	-1.37	1.47	-6.03	2.27
27	-0.84	9.77	0.36	1.45	4.33	0.90	0.75	0.81	-0.11	0.07
	0.49	10.61	2.03	0.28	2.46	-1.23	0.67	2.07	-0.57	-1.63
28	-0.15	0.73	0.21	2.07	1.47	2.60	-1.21	1.28	0.56	2.71
	-0.64	-1.75	1.95	1.38	1.22	1.63	-0.71	1.44	3.84	2.74
29	0.22	-0.40	1.03	2.39	3.41	-0.44	0.65	2.23	2.06	1.70
	1.89	0.52	0.38	2.01	2.33	0.54	1.61	1.86	1.58	1.07
30	-2.56	-0.94	-0.09	0.02	0.18	1.63	-0.89	-0.17	0.85	0.06
	-0.84	0.26	1.66	0.02	2.38	0.01	-0.41	0.35	1.94	-0.38
31	-1.41	-1.46	0.16	3.23	2.22	1.62	-0.34	0.22	1.97	0.93
	-0.92	-0.76	0.53	1.50	0.27	3.22	-0.90	0.39	0.61	0.25
32	-3.21	2.25	1.84	0.10	16.65	2.68	1.13	4.03	2.43	0.63
	-1.07	10.01	5.52	2.03	17.66	0.37	-3.79	2.29	2.75	1.48
33	-0.58	0.74	-0.46	0.01	6.16	1.31	-3.26	0.19	0.87	1.07
	-0.33	-0.20	0.74	2.45	6.14	2.22	-0.07	0.67	2.22	3.35

Table 3.6 Unirradiated Round 2 Test Materials: *z*-Scores for Participants 14-25

Test Material	Lab 14	Lab 16	Lab 17	Lab 18	Lab 19	Lab 20	Lab 21	Lab 22	Lab 23	Lab 24	Lab 25
1	-2.27	0.04	2.41	4.00	0.21	1.69	-0.98	4.61	3.13	6.15	-2.21
	1.16	-0.70	1.97	4.38	-1.17	0.81	1.59	21.20	1.37	-0.03	-0.59
2	3.18	2.92	3.01	13.93	5.19	3.58	0.63	1.83	3.71	1.83	2.64
	1.93	1.62	5.80	16.55	2.87	2.77	-1.90	6.47	5.95	5.42	4.08
3	-0.85	0.32	1.19	0.76	0.21	1.47	-0.62	-1.97	0.33	1.17	0.57
	0.89	0.67	-0.19	1.64	0.05	0.38	-0.50	-0.86	1.64	2.61	3.28
4	0.11	0.63	1.42	6.81	2.54	1.22	-0.17	2.54	2.41	1.58	1.99
	0.60	2.91	-0.35	6.22	0.65	1.20	-0.39	7.29	2.50	0.11	0.66
5	0.48	3.91	1.32	3.59	0.00	-0.03	2.45	-1.20	0.42	2.43	0.72
	-0.80	5.11	1.23	0.75	1.80	0.31	1.29	1.24	0.37	0.57	4.24
6	0.93	2.17	2.06	3.73	2.08	1.66	1.09	0.65	3.06	2.15	1.83
	-3.81	2.12	-0.23	1.65	0.54	1.92	4.92	1.75	1.59	2.08	1.50
7	0.59	0.04	1.27	5.45	2.02	0.06	0.98	0.47	4.67	1.81	0.29
	-0.15	-1.56	0.64	3.75	1.77	1.29	0.26	1.16	2.11	1.37	2.08
8	2.79	0.98	1.64	9.50	2.47	0.42	-0.06	1.03	7.47	1.24	2.08
	-0.78	0.82	3.02	7.69	2.32	0.74	-2.05	4.74	2.95	1.26	1.05
9	5.74	2.77	14.36	8.47	4.18	0.64	0.12	15.22	5.43	3.09	2.47
	-0.50	-0.40	15.07	9.74	2.94	1.92	6.61	21.64	5.16	2.84	-0.80
10	3.91	-2.68	2.64	1.66	2.36	-1.79	-0.24	-1.58	1.89	-0.85	0.57
	1.39	-0.42	1.17	1.98	1.22	-0.18	2.23	-3.50	0.19	-0.45	-1.41
11	0.37	0.95	2.34	2.05	1.84	0.71	0.17	0.12	1.67	1.24	0.93
	-1.02	1.44	1.44	2.06	-0.03	0.64	2.00	0.60	1.30	1.11	1.38
12	-0.40	-0.57	-0.61	-0.60	0.49	-0.97	-1.74	-0.29	-0.58	-1.34	-1.29
	-0.67	-0.54	-1.27	-0.79	0.38	-0.82	-0.47	1.06	-1.04	-1.09	-1.19
13	2.75	0.16	3.08	1.03	2.12	2.15	-0.18	7.97	0.97	1.83	2.48
	0.58	1.32	1.77	4.24	1.11	0.84	-1.70	1.21	2.03	2.56	0.14
14	2.40	-0.09	1.27	8.54	-0.66	0.35	-0.32	0.51	-0.15	0.47	0.05
	-0.59	-1.85	-0.88	0.69	0.04	-0.39	-1.06	-0.06	-0.32	-0.01	-1.07
15	3.34	0.48	-0.33	0.74	3.63	0.41	0.11	0.17	0.91	1.12	-0.31
	0.13	0.99	1.32	0.54	1.38	0.46	1.36	0.27	0.82	0.40	0.81
16	2.09	0.33	2.16	9.15	1.50	1.53	-1.01	1.33	1.48	1.02	1.73
	1.07	-0.25	2.31	4.61	1.79	0.00	3.50	0.47	1.96	-0.77	2.30
17	-0.04	-0.45	0.15	3.97	3.13	-0.65	1.61	2.67	0.45	-0.74	-0.58
	-0.45	-0.47	0.33	3.30	0.54	-1.13	-0.47	3.32	0.85	0.06	-0.23
18	2.35	-2.69	-0.56	22.04	0.03	1.69	0.46	21.83	2.38	2.52	1.95
	0.43	0.39	5.64	18.86	2.16	2.91	1.50	22.20	2.11	8.79	2.48
19	-1.14	-0.92	1.09	4.32	0.01	1.72	1.56	0.33	-0.97	1.45	1.41
	1.15	-0.59	1.09	1.86	-0.03	2.70	-3.89	0.48	1.16	-0.08	0.37
20	1.26	0.10	1.16	2.08	1.67	-0.06	-0.52	-1.10	1.27	1.01	0.73
	1.61	1.98	1.34	2.84	1.52	-0.19	-0.17	0.78	2.51	-0.17	0.92
21	-0.31	0.96	-0.02	2.02	0.57	-1.03	-0.96	0.15	1.91	2.33	0.09
	0.15	2.10	0.19	2.24	0.96	-1.66	0.25	0.79	5.62	1.38	0.43
22	-0.93	1.23	-0.56	1.86	2.95	1.95	0.08	-0.93	0.13	1.15	1.29
	-0.38	1.31	-0.35	1.59	0.96	1.88	-0.22	0.98	0.63	2.34	1.24
23	1.34	-3.27	2.41	1.84	1.28	-0.69	-0.11	-1.60	0.73	3.04	0.11
	0.17	-0.53	-0.04	5.29	1.43	-1.19	-3.18	2.94	1.55	1.38	-0.53
24	-2.77	-2.14	-0.14	2.41	0.31	-0.92	0.22	-1.37	0.99	-1.68	-2.39
	1.36	-3.04	0.84	3.37	1.92	-0.04	-2.36	-3.18	-1.04	-0.82	1.47
25	6.03	-0.94	1.01	0.55	0.55	-0.93	-0.37	-0.04	0.90	22.10	0.38
	1.06	-0.84	0.27	0.45	0.87	-0.94	0.82	-1.53	0.72	22.62	0.98
26	-2.45	-2.75	0.27	3.64	3.09	-0.92	-1.72	-2.58	0.71	0.57	-0.28
	2.49	-0.34	-0.44	3.60	2.61	0.02	-2.67	-0.73	2.73	1.19	0.96
27	3.10	-0.92	0.43	2.11	-0.33	0.20	1.20	1.22	1.51	1.15	1.11
	-0.08	1.09	2.09	0.74	1.01	1.07	-1.75	-2.45	1.74	1.02	0.86
28	-0.48	1.08	1.11	1.34	1.53	-0.13	0.71	4.23	1.58	2.25	1.94
	0.32	1.74	-0.63	1.86	1.47	0.53	0.29	1.00	4.33	4.27	1.20
29	-0.42	1.39	1.21	8.13	1.11	1.14	1.64	2.30	20.44	-0.09	1.92
	1.11	1.30	1.59	2.51	0.89	0.42	-0.80	1.21	19.31	1.86	2.29
30	-0.50	-0.91	3.96	1.18	1.63	-0.54	0.56	-1.39	0.03	0.35	-1.05
	-1.47	0.14	-0.69	1.55	2.76	-0.31	1.77	-1.62	0.11	0.98	-0.57
31	0.20	1.38	-0.23	2.55	1.62	-0.15	-0.45	-0.61	3.06	3.67	0.94
	0.64	1.72	-0.46	3.02	1.85	-0.56	1.60	3.86	1.19	1.83	-0.20
32	2.27	-2.63	2.93	24.81	2.68	-3.00	-2.81	12.39	3.28	1.61	2.07
	-3.96	-1.25	10.05	24.30	4.56	-2.78	2.40	19.47	2.38	-0.06	-0.17
33	0.72	1.54	1.84	4.93	1.74	-1.10	1.20	6.21	1.42	0.56	0.10
	0.19	1.77	0.27	5.61	2.06	0.13	-0.31	-1.32	0.11	1.51	0.77

Table 3.7 Unirradiated Round 2 Test Materials: *z*-Scores for Participants 26-35

Test Material	Lab 26	Lab 27	Lab 28	Lab 29	Lab 30	Lab 31	Lab 33	Lab 34	Lab 35
1	0.04	0.59	4.79	22.59	-0.96	-0.89	2.27	4.31	1.30
	0.65	-0.59	3.94	18.72	0.59	-0.05	0.53	3.06	2.22
2	2.64	0.98	0.81	2.81	1.27	8.86	5.60	4.17	4.00
	1.13	4.55	2.61	5.15	2.72	8.61	6.57	3.18	3.75
3	0.44	-1.36	-0.87	2.10	-1.33	-0.94	0.05	2.97	0.11
	-0.90	-1.57	1.65	-1.49	-1.60	-1.12	-0.63	-1.28	-0.18
4	1.59	-0.33	1.86	5.21	-0.84	2.06	1.07	-0.19	4.76
	1.47	0.65	0.25	5.11	2.15	0.85	0.89	-0.31	0.74
5	3.68	-1.36	0.68	1.62	2.08	5.42	-0.31	-0.25	1.95
	2.07	-1.55	1.85	1.61	-0.83	5.75	0.35	0.16	6.45
6	2.17	-0.17	1.68	-5.16	0.73	1.99	-3.78	-0.22	2.64
	0.32	-0.51	0.15	0.34	0.71	-11.22	41.31	1.15	1.19
7	3.40	-1.05	5.20	0.21	1.15	0.06	0.95	0.92	1.26
	1.91	-0.62	-0.13	-0.16	1.03	-6.69	-2.17	1.42	1.33
8	0.15	1.81	1.35	7.16	-0.49	-0.88	3.65	0.91	3.98
	0.67	-1.19	0.15	9.19	0.05	-0.37	3.79	1.62	1.24
9	-1.48	-1.15	7.71	36.81	-0.11	1.06	2.44	0.49	4.71
	3.46	0.12	9.29	33.84	1.97	-1.55	0.91	3.83	3.58
10	-0.30	1.34	1.70	0.44	-0.27	3.38	0.65	1.12	4.00
	-1.61	0.81	4.19	3.35	-3.00	-3.72	1.27	0.41	1.80
11	3.35	0.60	2.27	1.05	-0.34	1.35	-6.50	-1.51	1.96
	2.37	0.46	0.15	1.73	2.45	-0.90	2.31	0.32	1.66
12	-1.11	-1.90	0.93	-0.83	-1.33	-0.94	-1.40	-1.49	-0.51
	-1.65	-1.43	-1.65	-1.53	-1.72	-1.30	-0.86	-1.18	0.82
13	2.28	0.12	2.63	1.66	0.93	1.95	41.18	0.46	0.38
	0.69	-1.40	-1.30	0.52	2.22	1.41	1.32	0.45	2.40
14	-0.05	-1.21	0.15	0.13	-0.66	-1.17	0.83	0.93	-0.64
	-0.25	0.02	0.41	-1.48	-0.13	-1.51	-1.45	0.15	-0.26
15	0.27	0.09	1.19	0.33	0.56	-0.20	0.58	1.55	1.06
	0.48	0.33	1.09	-0.17	0.23	0.24	0.93	0.78	1.10
16	1.20	2.23	3.10	9.38	0.91	1.45	2.57	1.00	0.72
	1.78	1.02	1.59	5.26	1.79	1.33	2.50	0.76	2.08
17	-0.19	-0.69	-0.28	7.34	-0.80	2.16	1.63	-0.95	1.58
	-0.70	-1.35	0.63	6.51	-0.60	0.66	0.66	-0.88	1.14
18	11.93	9.33	9.49	26.36	0.69	4.49	15.69	2.37	0.63
	7.37	8.93	7.92	31.47	2.03	1.33	10.06	0.41	1.83
19	3.75	-0.79	1.66	1.54	2.48	2.74	-0.46	2.50	1.98
	-1.11	1.35	2.03	1.65	-0.36	-0.84	3.18	0.83	1.75
20	-0.11	-2.56	2.42	-0.34	0.39	0.14	6.37	0.18	2.07
	1.64	0.33	0.67	-0.63	0.81	0.87	1.34	-0.43	1.48
21	-0.09	-0.04	-1.01	-0.63	-0.17	-0.11	-0.22	0.44	0.78
	0.22	-1.55	-1.60	-1.08	-1.11	0.26	-0.85	0.78	3.43
22	0.38	-0.77	0.10	-0.60	-0.85	-1.86	-1.20	-3.63	-0.20
	-0.94	-0.57	-1.84	0.88	-1.29	-1.71	0.05	-3.11	0.74
23	-1.07	-0.25	0.22	1.09	-1.10	-0.27	-0.99	0.02	-0.21
	1.04	0.02	-5.53	-0.77	-0.53	-0.09	-2.04	-0.09	3.20
24	-0.31	-1.02	-0.47	3.49	0.34	0.79	-0.76	1.20	3.46
	-0.57	0.29	1.86	2.04	-0.36	1.50	-3.40	-0.92	2.59
25	-0.22	-0.28	1.48	-2.29	1.13	-0.22	0.67	0.70	5.68
	0.35	-0.65	1.87	0.10	0.18	-2.84	0.59	-0.10	2.17
26	-1.03	-1.18	-0.96	1.46	0.59	0.94	1.49	-2.29	2.46
	2.13	0.83	3.56	0.72	0.46	0.17	-3.45	0.67	0.23
27	4.07	-1.04	1.35	-1.19	-0.44	1.14	2.09	0.04	1.25
	2.91	-1.49	-1.25	0.04	-0.13	0.20	-1.49	-0.09	0.64
28	0.70	-1.43	2.38	6.91	-1.07	-3.07	-1.75	3.67	2.69
	5.37	-2.75	1.38	5.34	-1.12	-2.30	-1.30	-0.01	0.67
29	0.05	2.01	3.74	9.89	0.68	1.44	1.65	2.47	0.07
	1.73	0.82	6.68	8.44	0.19	-10.03	1.32	1.88	0.84
30	-1.95	-2.24	-2.19	1.18	-2.84	-1.36	-3.28	-0.77	10.02
	-1.18	-1.28	-0.28	1.91	0.17	-1.15	-2.01	0.42	1.78
31	-0.71	-1.27	-0.53	1.45	-1.41	-1.66	-2.23	1.21	-0.16
	-0.21	-2.29	1.08	0.61	-2.56	-2.59	-2.85	-1.63	0.39
32	0.91	0.10	3.60	44.68	-2.06	20.06	9.80	-0.97	2.49
	2.89	-0.41	1.42	52.80	-7.34	20.88	-0.41	3.23	2.20
33	0.91	-1.43	-0.48	1.26	0.01	5.88	1.45	1.54	2.19
	-0.29	-0.99	-0.85	-0.70	1.34	3.84	-0.97	0.98	2.92

Table 3.8 Irradiated Round 2 Test Materials: *z*-Scores for Participants 1-13

Test Material	Lab 1	Lab 2	Lab 3	Lab 5	Lab 6	Lab 8	Lab 9	Lab 11	Lab 12	Lab 13
1	-1.64	-0.97	-1.25	0.33	0.71	0.60	-1.24	5.40	2.44	1.42
	-1.45	-2.50	-1.52	0.35	1.24	3.62	-0.95	0.03	2.05	0.13
2	-4.83	-5.27	-7.40	-17.43	-6.69	-12.71	-2.58	-45.32	-4.03	-4.05
	-5.33	-23.89	-19.10	-12.48	-12.57	-11.52	-21.07	-23.65	-6.11	-3.78
3	-2.48	-4.95	-8.82	-4.03	-3.49	-4.21	-7.73	-2.66	-6.37	
	-2.14	-2.70	-8.16	-12.62	-9.61	-3.42	-5.59	-4.83	-2.39	
4	-2.64	-2.16	1.44	1.71	-0.90	2.66	-1.25	-0.59	0.37	0.79
	-1.48	-1.01	2.88	-0.38	0.17	4.21	-0.69	-1.44	1.20	1.69
5	-2.44	-1.21	13.03	4.37	10.03	4.10	7.45	6.82	9.62	1.13
	-2.19	2.56	13.69	4.86	9.60	4.84	11.00	0.39	7.45	0.73
6	-1.14	-2.53	4.39	2.37	0.85	1.94	-1.62	1.36	1.47	0.21
	-2.25	-1.37	4.34	2.94	2.43	1.88	-1.20	2.03	2.77	0.42
7	-2.13	-4.11	0.11	-0.73	3.79	1.82	-4.82	0.54	-0.49	0.69
	-1.39	-2.31	-2.44	0.66	3.65	0.04	-3.22	1.86	3.89	0.86
8	-0.31	-2.21	-0.32	0.19	-0.78	1.44	-2.27	0.81	1.71	0.00
	-1.31	-1.19	-2.21	1.77	0.54	1.48	-2.72	-0.27	2.07	-0.03
9	-0.47	-2.19	0.11	3.32	0.15	1.20	1.34	-0.13	1.25	0.50
	-1.03	-0.10	-0.38	1.33	1.69	0.73	0.87	2.58	2.49	0.56
10	-3.02	4.20	0.30	2.24	2.13	1.46	-0.87	0.71	0.37	4.19
	-0.99	-2.65	-0.49	3.24	3.86	0.50	-1.06	0.92	2.47	2.06
11	-1.76	-4.29	-1.21	1.12	0.28	-1.12	-0.69	-0.44	2.17	1.61
	-0.21	-2.87	-1.34	0.04	2.85	2.55	-2.80	1.37	0.40	2.63
12	-1.59	-0.14	-1.66	-0.98	-1.27	-1.03	-1.20	-0.37	-0.68	-1.09
	-0.88	-1.46	-0.96	-0.50	-0.80	-0.10	-1.79	0.13	-0.19	-0.57
13	-2.48	-4.72	2.73	0.45	0.36	3.69	0.67	0.85	0.77	-0.82
	-3.57	-0.89	-1.03	3.19	-0.40	1.18	-1.32	1.16	3.08	-0.37
14	-6.43	-24.34	-1.65	-16.19	-10.57	-26.12	2.43	-6.36	-23.97	-2.69
	-5.28	2.48	-4.65	-17.62	-16.13	-22.13	-23.68	-22.64	-4.91	-2.81
15	-2.62	-3.09	-0.65	1.30	0.00	-0.53	-0.94	-0.28	0.56	-0.53
	0.66	-2.35	-1.62	0.14	-2.11	-0.55	-1.45	-0.89	-0.18	-1.95
16	-0.40	-1.86	-0.36	0.53	-0.37	0.54	-0.18	-0.13	2.05	-0.17
	-2.03	-0.97	-0.14	0.85	-2.41	0.41	-0.33	-1.48	-0.24	-0.61
17	-0.23	-2.52	-1.27	0.01	0.37	2.29	-0.81	-0.37	0.47	1.22
	0.86	-1.89	-0.39	1.82	1.30	0.98	-1.23	0.75	1.04	-0.67
18	-3.38	-3.49	-1.45	2.05	0.77	0.30	-2.66	-0.62	7.59	2.02
	1.70	-2.11	-2.47	3.17	0.33	1.40	-2.51	0.53	1.87	2.20
19	-4.94	-5.98	-0.75	3.02	2.34	0.86	-3.66	5.66	2.26	2.53
	-4.89	-5.20	1.24	1.66	3.84	2.32	-4.03	1.81	3.21	1.88
20	-3.15	1.32	-2.00	-2.11	0.70	-0.05	-1.12	-0.74	-0.05	1.70
	-1.94	0.41	-2.22	-1.16	-0.13	1.16	-1.44	1.24	4.16	0.42
21	-0.63	-2.80	-0.51	2.02	1.28	1.68	-0.85	-0.11	1.18	1.83
	-2.27	-1.53	2.56	2.51	2.39	1.07	-0.33	0.98	1.16	1.16
22	0.89	-3.57	2.02	4.73	3.08	2.89	-3.03	1.84	1.62	0.28
	0.20	-3.31	-0.15	1.32	1.60	4.89	-4.64	3.54	1.07	-0.43
23	-1.77	-2.16	3.74	-0.09	4.17	0.67	-0.76	3.41	1.14	5.27
	0.23	-0.64	1.79	0.95	1.64	1.95	-0.89	4.99	-0.29	4.70
24	-0.93	0.40	1.14	-0.74	0.54	0.85	0.48	0.37	0.63	0.31
	-0.33	-0.69	0.57	-0.07	0.71	0.28	-0.20	0.01	1.04	0.04
25	-0.23	-1.78	-0.46	2.32	1.65	0.73	-0.17	-0.71	1.08	0.68
	-1.53	-1.11	0.51	0.35	0.47	3.56	-0.02	-0.05	2.14	0.79
26	-0.88	-1.17	0.57	1.11	2.74	2.77	-2.10	0.21	1.09	2.28
	0.56	-2.51	1.00	-0.27	3.74	2.96	-0.72	1.14	0.27	1.24
27	-0.64	-0.99	0.39	0.28	0.54	0.24	2.78	0.35	-0.41	0.81
		-0.85	-0.62	2.21	-0.11	-0.19	1.01	-0.64	-0.02	-0.41
28	-3.20	-4.73	-0.91	1.04	1.25	2.08	-2.98	-0.14	2.52	1.87
	-3.92	-3.19	0.19	0.72	3.20	2.91	-2.78	1.71	1.68	1.09
29	-1.70	-0.83	-0.87	1.60	3.65	-0.37	0.63	0.64	0.55	1.06
	-1.48	1.30	-0.72	0.03	0.47	1.92	-1.04	0.98	0.09	1.34
30	-3.63	-3.92	1.45	5.06	1.57	4.98	-3.86	-0.08	4.57	3.53
	-2.97	-5.20	2.12	2.21	1.38	2.70	-2.41	0.97	5.32	1.58
31	-4.44	-4.11	-5.16	3.97	0.48	3.67	-4.35	3.39	2.15	1.30
	-3.27	-2.83	-5.18	4.25	2.58	5.17	-1.44	3.00	1.50	0.58
32	1.03	-0.87	0.78	0.93	0.60	0.74	-1.43	0.95	0.38	-0.57
	-1.79	-1.43	0.55	1.52	1.17	2.11	-0.96	1.55	0.18	-0.04
33	-2.27	-2.62	1.42	0.24	2.01	8.06	-0.77	5.28	1.56	-0.77
	-2.10	-1.45	1.02	0.50	1.88	4.78	-1.54	2.34	5.81	-0.70

Table 3.9 Irradiated Round 2 Test Materials: *z*-Scores for Participants14-24

Test Material	Lab 14	Lab 16	Lab 17	Lab 18	Lab 19	Lab 20	Lab 21	Lab 22	Lab 23	Lab 24
1	-0.24	0.54	1.26	0.06	2.34	-0.13	-0.64	-0.05	1.52	3.75
	-0.49	0.91	0.63	1.67	0.53	0.19	-1.03	-2.91	0.43	2.79
2	-4.48	-5.25	-3.57	-18.36	-2.63	-3.58	-12.88	-40.85	-3.02	-4.58
	-3.94	-5.00	-8.48	-6.05	-2.34	-3.30	-5.23	-15.89	-6.73	-4.06
3	-10.31	-6.30	-3.47	-4.01	-1.92	-3.37	-4.55	-3.57	-6.19	-5.39
	-5.23	-5.05	-3.19	-9.27	-1.61	-3.83	-6.67	-4.34	-6.76	-6.40
4	-1.58	3.54	0.01	-0.27	1.67	-2.09	-0.60	-2.11	1.11	-0.40
	-1.66	2.98	0.36	-0.19	2.50	-2.37	-1.87	1.21	-0.07	-1.37
5	4.34	-0.61	3.53	6.58	0.82	-0.55	7.16	-3.01	0.07	0.34
	4.49	0.16	0.95	3.98	0.82	-1.09	6.92	0.76	-1.06	-0.06
6	-0.67	1.56	1.76	1.08	2.70	-0.30	-1.81	-1.68	1.28	-0.56
	-0.75	2.22	0.79	1.50	1.28	0.21	-0.29	-2.35	2.32	1.29
7	-2.92	2.05	-1.14	0.29	0.53	-2.00	0.27	-3.02	2.07	0.16
	-1.42	-0.02	-0.34	-0.69	1.46	-2.46	0.66	-2.87	1.84	1.42
8	-0.41	-1.04	-1.49	-1.24	0.37	-2.34	-1.92	-2.71	-0.93	-1.40
	-1.43	-0.65	-1.53	0.74	-0.42	-2.12	-0.60	-2.72	-0.28	-0.38
9	-0.49	0.82	0.61	0.40	1.33	-0.93	0.75	-0.43	1.70	0.76
	-0.53	1.46	-0.12	0.46	0.73	-0.10	0.27	0.74	5.49	0.55
10	0.76	0.64	0.20	0.16	0.62	-1.79	-1.15	-2.64	3.10	-0.77
	-0.90	0.23	-0.10	-1.13	0.46	-3.40	-0.46	-0.38	-1.37	-0.66
11	0.16	-0.17	0.15	-0.33	1.36	-1.59	-0.44	-1.64	1.55	0.86
	1.93	1.28	-1.80	0.31	0.87	-2.15	-0.95	-2.61	0.60	2.13
12	-1.59	-0.20	-1.76	-0.96	-0.32	-0.91	-1.12	-1.25	-0.67	-1.11
	-0.98	-0.12	0.21	-1.14	-1.43	-1.30	-1.15	-1.95	1.54	-0.11
13	1.41	0.14	-0.97	-2.03	0.51	1.21	-2.90	2.30	1.97	0.81
	-0.41	-0.60	-1.37	6.48	-0.46	1.57	-5.12	-0.39	0.60	1.74
14	-18.82	-3.13	-19.09	1.83	-3.43	-2.72	0.11	-28.60	-1.97	-21.28
	-12.71	-3.47	-26.23	-19.43	-0.44	-2.41	-2.24	-16.70	-2.56	-15.00
15	-2.12	-0.58	0.79	0.88	0.63	-2.73	-1.82	-1.98	-0.63	0.62
	-1.20	-0.69	0.60	-1.21	-2.49	-2.28	-1.09	-1.37	0.73	2.96
16	-0.78	-1.16	0.30	-1.19	1.44	-2.04	-0.56	0.12	0.09	0.82
	-0.65	-0.22	-0.18	-0.11	-0.31	-2.21	-2.43	-1.25	-0.63	-0.52
17	-0.75	0.15	0.09	-2.44	-0.40	-0.99	-0.86	-1.27	-0.25	1.42
	-0.93	1.57	-0.74	-2.75	-0.25	-1.12	0.39	-0.83	1.90	2.98
18	0.33	1.21	-0.27	-0.50	0.43	-2.67	-0.83	-1.56	0.48	2.21
	-0.53	1.28	-0.01	0.12	1.53	-2.16	0.03	-2.61	0.89	3.04
19	-0.39	-0.37	0.08	-2.43	2.38	-2.67	-3.37	-2.55	1.88	2.86
	0.37	3.25	0.54	0.15	0.20	-2.20	2.84	-1.89	1.04	2.04
20	-2.04	0.96	0.22	-0.21	0.14	-1.31	-0.70	2.86	5.84	1.05
	-1.68	0.73	-1.07	1.23	-0.76	-1.99	-1.59	1.03	-0.37	1.26
21	0.99	1.08	-0.34	-0.31	2.78	-0.34	-1.12	-0.68	0.87	2.33
	-0.90	1.01	-1.72	-0.09	1.11	-0.35	-0.41	0.15	0.89	2.22
22	-1.21	2.06	-0.18	0.19	1.32	-0.03	-5.34	-2.31	2.66	4.36
	-1.14	3.31	-0.10	0.91	-0.03	0.72	-1.85	-4.23	0.76	3.85
23	2.26	1.30	0.08	0.31	-0.05	-0.32	-0.77	0.67	0.33	3.12
	-0.86	2.35	2.87	-0.06	2.25	0.16	-0.12	0.43	1.99	4.57
24	0.74	0.08	-0.21	-0.31	0.69	-0.59	0.20	-0.40	-0.11	0.70
	0.09	0.20	-0.09	0.52	-0.13	-0.69	-0.10	-0.30	-0.07	0.98
25	0.25	-0.88	0.43	1.37	1.18	0.18	-0.88	-0.09	1.48	0.78
	0.15	0.34	0.47	2.22	1.20	-0.32	-0.20	-1.57	1.56	1.95
26	-3.97	0.81	-1.75	0.87	1.59	-0.09	-1.46	-1.73	1.39	2.86
	-0.44	1.40	-1.99	-0.40	0.21	-0.44	-1.09	-0.94	0.21	3.62
27	-0.49	-0.32	-0.89	-0.84	0.15	-0.31	-0.24	-1.12	-0.34	0.98
	0.91	-0.53	-0.83	0.30	-0.77	-0.25	-0.47	0.63	0.11	0.92
28	-1.53	1.86	-1.67	-9.43	0.61	-1.63	-2.33	-4.27	1.78	2.97
	-2.52	2.64	-2.16	-1.95	-1.05	-1.10	-2.89	-5.48	0.87	3.88
29	-0.45	-0.51	-0.70	0.52	0.56	-0.84	0.15	1.36	0.22	1.47
	-0.09	-0.82	0.04	0.59	0.09	-0.85	-0.13	-0.21	0.24	0.62
30	1.37	3.17	2.35	1.42	2.70	-2.30	0.11	-1.97	4.38	5.79
	0.47	2.51	1.41	-0.10	3.60	-1.32	-4.22	-1.62	4.23	6.94
31	-0.57	-4.71	-1.69	-1.40	2.22	-2.89	-3.11	-4.09	0.25	-0.83
	-3.42	-3.37	-0.91	-2.28	2.32	-2.16	-2.51	-4.21	1.51	-0.09
32	-1.11	0.68	-0.95	-0.17	2.56	-1.23	-1.13	-1.94	2.35	0.13
	1.90	-0.06	-0.77	-1.15	-1.17	-1.68	-0.62	-0.68	0.21	0.50
33	1.15	4.80	0.25	6.55	4.79	0.02	1.05	-2.75	3.50	4.14
	0.10	4.27	-1.50	9.21	0.37	-0.78	4.02	-1.76	2.16	2.49

Table 3.10 Irradiated Round 2 Test Materials: *z*-Scores for Participants 25-35

Test Material	Lab 25	Lab 26	Lab 27	Lab 28	Lab 29	Lab 30	Lab 31	Lab 33	Lab 34	Lab 35
1	-0.87	-1.63	-3.59	0.04	-1.06	-2.95	-4.17	-2.88	0.07	2.65
	0.41	-2.08	-2.58	-0.38	-1.13	-3.56	-5.19	-2.76	0.07	0.63
2	-3.70	-2.67	-7.09	-11.12	-15.65	-3.35	-4.95	-2.87	-8.99	-10.29
	-2.91	-31.12	-5.07	-18.28	-16.07	-19.85	-7.57	-4.66	-11.10	-4.38
3	-8.76	-4.87	-2.88	-3.20	-2.45	-3.54	-4.60	-2.95	-2.52	-6.03
	-3.91	-2.90	-3.26	-3.51	-3.90	-10.66	-4.14	-7.63	-2.68	-6.13
4	-1.00	3.75	-4.09	1.12	0.34	-2.04	-4.91	-1.06	-3.26	2.68
	-0.95	-1.93	-3.21	-0.22	2.95	-3.30	-5.38	-0.08	-3.25	-2.02
5	-0.29	7.24	-3.40	7.78	8.37	1.02	4.20	8.30	2.19	2.59
	-0.59	9.18	-2.61	8.98	7.68	-0.01	1.05	6.26	-1.83	1.89
6	1.09	-1.83	-2.26	0.49	-0.09	-3.17	-3.48	-2.45	-6.21	-0.01
	-0.99	-1.71	-2.97	1.47	-0.92	-2.42	-5.37	-2.25	-2.59	-1.81
7	0.66	-1.71	-4.02	-1.78	1.44	-2.67	-4.04	-2.67	-17.11	-0.16
	-3.23	-2.26	-4.07	-0.91	1.58	-2.24	-5.20	-2.87	-16.45	0.60
8	-2.11	-2.33	-4.38	-1.28	-0.76	-2.89	-2.74	-3.00	-3.19	2.76
	-2.31	-2.32	-4.31	-1.79	-1.63	-2.14	-3.23	-0.86	-2.66	-1.86
9	1.17	0.97	0.53	-0.41	0.01	-0.34	-0.70	-0.25	-0.23	0.20
	-0.78	-0.84	-1.00	-0.63	0.95	-0.16	-0.44	-1.62	-0.43	0.28
10	-1.94	-1.54	-4.76	-1.42	0.87	-1.51	-4.14	-1.59	-4.69	0.52
	-1.74	-1.50	-4.80	-1.57	0.61	-2.39	-5.07	1.99	-4.29	-0.48
11	-0.75	-0.65	-4.37	-1.33	2.08	-2.75	-3.61	-2.22	-11.90	0.86
	-0.06	-3.55	-2.55	-0.94	1.35	0.51	-4.68	-1.76	-1.68	-1.08
12	-1.22	-1.28	0.50	-0.17	-2.14	-1.90	-2.58	-1.69	-1.33	-0.98
	-1.45	-1.28	-0.95	-1.05	-0.93	0.27	-2.92	0.15	-1.60	-0.47
13	2.75	-3.91	-4.80	0.47	-0.68	-1.78	-5.14	2.43	-0.13	-0.93
	-3.25	-4.14	-2.81	-0.62	-0.14	-2.90	-6.57	0.56	-0.37	-2.97
14	0.77	-11.14	-9.86	-10.58	-4.32	-12.28	-6.65	0.81	-9.00	-24.76
	0.25	-2.14	-3.82	-18.71	-13.80	-3.67	-0.66	-3.74	1.01	-15.60
15	-0.18	-3.33	-3.80	-0.49	-1.79	-3.33	-5.15	-2.45	-1.34	0.81
	2.88	-2.85	-5.46	-1.53	-3.33	-0.42	-5.94	-3.07	-1.34	-1.35
16	0.33	-1.28	-0.71	-1.57	-0.40	-1.15	-0.66	-1.34	-3.87	-0.77
	0.78	-0.01	-2.25	0.01	-0.80	-0.93	-1.08	-1.48	-2.98	-0.87
17	1.07	-1.80	-1.89	0.13	-0.11	-4.27	-2.26	-1.82	-1.58	0.27
	-0.54	-1.21	-2.30	0.39	-1.28	-1.98	-2.79	-1.64	-5.86	-0.41
18	0.44	-3.18	-4.91	-0.99	-0.86	-3.19	-6.32	-3.29	-2.35	-0.17
	2.02	0.38	-5.15	-1.36	-0.65	-6.22	-7.58	-2.00	-0.92	-0.15
19	-0.75	-4.65	-12.65	-1.84	2.12	-5.82	-10.54	-5.14	-12.92	1.61
	0.03	-5.70	-10.71	-3.76	2.13	-10.36	-14.45	-7.82	-22.88	-0.52
20	-2.50	-1.44	-4.99	-0.38	2.03	-0.43	-2.13	-1.77	-6.05	0.88
	-1.33	-3.31	-4.17	-1.57	1.90	-1.97	-3.36	-2.38	-4.45	-0.95
21	-0.33	-0.91	-4.54	0.36	-1.25	-2.78	-4.38	-2.00	-4.35	1.02
	0.74	-2.60	-4.10	0.19	-1.56	-1.70	-5.45	-1.90	-4.07	1.27
22	0.34	-0.97	-7.09	0.60	-1.45	-2.99	-3.65	-3.79	-3.27	0.09
	1.16	-3.39	-5.33	-1.10	-0.75	-3.46	-5.22	-3.93	-13.76	0.49
23	-0.31	0.62	-1.00	0.67	5.70	1.58	-1.35	-0.48	-1.81	-1.37
	-0.67	0.90	-1.87	-0.30	0.47	-1.53	-1.46	0.76	-2.72	0.08
24	0.54	-0.20	-0.11	0.23	0.20	-0.54	-1.11	-0.06	-1.40	0.08
	-0.61	-0.31	-1.09	0.09	-0.30	-0.96	-1.42	-0.87	-0.69	0.17
25	1.13	0.23	-1.78	-0.32	-0.54	-0.86	-1.74	0.50	-2.42	1.13
	-0.02	-0.37	-0.39	-0.40	-1.00	0.57	-2.73	-0.88	-1.94	-0.29
26	-0.87	-1.21	-4.80	2.03	0.33	-0.44	-3.52	-3.17	-6.49	-1.11
	-0.85	-2.65	-4.37	-0.99	-1.20	-3.26	-4.68	-1.02	-5.40	0.14
27	-0.39	-0.79	-0.47	-0.55	-1.29	-1.41	-1.36	-0.83	-0.97	-0.73
	-0.46	-0.82	-0.94	0.82	-0.77	-1.12	-1.57	-0.47	-0.48	-0.15
28	-0.10	-5.38	-7.82	-1.48	-0.64	-1.56	-7.37	-2.63	-11.17	-1.21
	-0.77	-3.19	-4.81	-1.16	0.19	-5.38	-9.48	-4.63	-12.20	-1.18
29	-0.21	-1.29	-1.60	0.27	3.43	-0.96	-1.46	-1.61	-1.27	0.21
	-0.71	-1.10	-0.49	-0.36	3.93	-1.01	-1.72	-2.85	-0.55	0.62
30	-0.04	-2.64	-8.19	0.58	-0.91	-2.49	-8.48	-4.11	2.41	1.20
	-1.41	-4.06	-7.43	1.79	-0.44	-4.29	-11.06	-5.26	4.50	-1.27
31	-0.97	-5.27	-10.46	-0.84	-0.19	-7.66	-11.71	-6.20	-8.05	-1.76
	-1.86	-3.01	-9.57	-1.32	1.06	-7.56	-14.23	-6.66	-9.70	-1.87
32	2.41	-2.45	-3.44	-0.74	1.11	-2.09	-3.08	-2.04	-2.44	-0.42
	1.07	-2.30	-3.21	-0.71	-1.38	-1.40	-3.98	-1.47	-3.52	-1.00
33	-0.98	-5.62	-7.13	1.39	0.32	-3.72	-4.37	0.33	-8.74	1.93
	5.83	-3.42	-3.76	-1.60	12.76	-3.95	-6.36	1.63	-5.13	4.08

Table 3.11: Blended Round 2 Test Materials: *z*-Scores for Participants1-13

Test Material	Lab 1	Lab 2	Lab 3	Lab 5	Lab 6	Lab 8	Lab 9	Lab 11	Lab 12	Lab 13
17	1.54	-0.88	0.35	0.77	4.54	0.43	-0.52	1.30	0.21	0.87
	0.55	-1.06	2.38	1.34	0.97	1.45	0.10	0.24	2.05	1.18
19	-0.30	-0.08	-0.01	2.10	2.30	0.23	0.07	1.52	0.53	0.34
	-1.58	-0.87	3.03	-0.80	0.67	0.13	-2.19	-0.67	0.47	0.05
21	-1.35	2.88	-0.95	1.44	1.56	2.07	-0.30	1.74	1.86	2.34
	-1.19	-0.14	-2.35	0.37	5.40	1.66	0.65	1.49	-1.10	-0.91
24	-0.41	-0.81	-0.59	0.00	0.20	0.43	-0.66	0.27	0.25	1.80
	-0.84	-0.70	1.36	0.38	1.90	1.56	0.50	0.54	0.06	1.48
31	-0.29	0.02	0.07	0.16	1.82	1.09	-0.57	0.60	0.29	-0.49
	-1.30	-1.36	-0.44	-0.52	2.74	-1.00	-1.94	-0.77	-0.22	0.02
32	-0.62	0.00	0.47	1.11	1.11	3.59	0.77	3.06	0.92	0.80
	-0.99	1.10	0.13	1.28	4.79	1.71	0.74	9.03	0.12	-0.82

Table 3.12: Blended Round 2 Test Materials: *z*-Scores for Participants 14-24

Test Material	Lab 14	Lab 15	Lab 16	Lab 17	Lab 18	Lab 19	Lab 20	Lab 22	Lab 23	Lab 24
17	1.81	0.81	0.71	0.09	1.81	-0.78	0.34	1.33	-5.79	2.01
	1.04	-0.23	2.26	0.58	0.66	-0.11	0.55	-0.27	1.58	2.42
19	-0.25	0.23	-0.34	2.26	-0.53	-0.03	-0.13	1.04	1.33	0.82
	0.72	-0.84	-0.84	1.39	-0.13	-1.79	-1.01	-0.64	-0.60	0.23
21	-0.56	5.43	1.79	-0.20	1.46	-0.35	-0.14	-1.98	0.72	2.17
	-0.71	0.42	0.74	3.81	1.50	-0.03	-0.52	-0.02	0.19	2.29
24	1.15	0.30	1.96	0.05	1.27	-0.71	0.55	-0.19	-6.38	2.33
	1.99	0.29	0.98	0.68	1.71	0.21	0.25	0.47	2.47	1.00
31	-0.55	0.02	-0.17	2.46	0.64	-0.29	-0.07	2.64	0.53	0.29
	1.13	-0.57	0.16	-0.09	-0.69	-1.73	-0.81	-0.94	-0.15	-0.09
32	3.02	5.41	0.43	-0.65	1.48	-1.26	1.41	-0.40	0.50	3.69
	0.25	-0.10	0.42	4.30	0.52	0.17	-0.68	0.50	0.48	2.19

Table 3.13: Blended Round 2 Test Materials: *z*-Scores for Participants 25-35

Test Material	Lab 25	Lab 26	Lab 27	Lab 28	Lab 29	Lab 30	Lab 31	Lab 33	Lab 34	Lab 35
17	1.66	0.07	-0.80	0.90	0.39	0.61	-1.08	-1.09	-0.59	2.29
	0.68	2.12	-0.05	1.78	0.40	0.20	-0.23	0.46	-0.49	0.91
19	1.02	-0.28	0.07	0.09	0.28	0.85	1.48	1.30	-0.74	0.62
	-0.58	-1.41	-1.03	-0.85	-0.49	-0.96	-1.86	-1.23	-1.74	1.49
21	-0.02	-0.46	-2.18	-0.11	0.45	-0.65	-2.81	-0.29	0.13	0.64
	-1.22	0.94	-0.29	1.55	4.96	-1.23	-0.11	-1.05	0.61	0.47
24	1.38	-0.30	-0.85	2.72	0.36	-0.80	-1.42	0.19	-1.40	0.64
	0.33	1.15	-1.16	0.35	0.40	-0.06	-0.15	0.27	-0.26	0.70
31	0.44	-0.42	0.06	0.46	-0.03	-0.69	0.75	-0.06	-0.15	0.58
	-0.38	-1.36	-1.27	-0.13	-0.66	-1.67	-1.86	-1.30	-1.93	0.39
32	0.16	0.94	-2.06	-0.20	-0.62	-1.28	-3.37	-0.31	-0.08	-1.09
	0.39	-1.56	-0.88	1.55	4.29	-0.61	-0.05	-0.55	-1.14	0.26

Figures 3.9-3.12 show the *z*-scores for irradiated, unirradiated, first by sample and then by laboratory.

In figure 3.9 it appears that for the unirradiated samples there are still a number of products with a wider range of z-scores than the majority. This suggests that these may be more problematic than the other materials. Samples 6 (Ground Cumin SP8517), 9 (Chives SP8520), 13 (Ground Coriander SP8526), 18 (Thyme SP8532), 25 (Milk Thistle SP8571), 29 (Guarana SP8575) and 32 (Green Tea SP8578) have produced outlying results. For these products with dispersed z-scores it is clear that several laboratories have produced the results appearing as outliers; with the use of duplicate aliquots a pair of outlying observations may represent a single laboratories' results from one product. It is not at this stage clear why these materials should have presented difficulties to some laboratories; they are not, for instance, multi-ingredient or salt-containing, nor is the order of presentation an explanatory factor for all of them.

When analysed by laboratory, as in figure 3.10 it is again apparent that there there are more positive than negative outlying z scores, suggesting that contamination of unirradiated samples may be occurring occasionally, but that it affects only a minority of laboratories in these data. In comparison with round 1 this represents a considerable improvement in results, although it appears that a small number of laboratories could still find room for improvement. Other than for these laboratory-sample combinations the majority of unirradiated test materials show closely zero centred z scores.

For the irradiated samples, shown in figures 3.11 and 3.12, there is a greater spread of z-scores. When analysed by sample there are three samples with a larger number of outliers. Samples 2 (Curry powder no 3 SP8513), 14 (Medium Curry Powder SP8528) and 19 (Rosemary SP8533) show systematically lower z scores than the other samples, implying that participants were unable to retrieve the same signal levels as the reference laboratory despite the similarities of response to the paprika standard. The first two of these are salt-containing products and it is possible that participants have still not corrected for counter overflows. Without the full set of PSL data files it is not possible to confirm this. For the other sample another explanation is needed. When arranged by laboratory, it appears that all participants have at least one or two samples showing low-z score values, implying some sort of signal loss or under-estimation relative to the reference data. Some laboratories show more extreme values or a greater proportion of such values, for reasons which are not at this stage clear.

To assess the possibility that some fading has occurred between the irradiation data and the time at which participants had measured their samples the results were examined as a function of post-irradiation delay. In the case of the reference data the values had been determined during round 1, using material that had been irradiated in 2005 and measured during the study with a post irradiation delay of approximately 40 days. Participants has reported their measurement dates, from which it was possible to prepare figure 3.15. There is no obvious relationship between Z scores from irradiated samples and post irradiation delays ranging from 45 to 112 days. Apparently fading is unlikely to explain the negative z-scores. A plot of only those samples with negative outliers also supports this. Considering other potential explanations it is noted that laboratory bleaching might be a factor. Also it is noted that the irradiation dose received in round 1 was close to the requested value of 10±1 kGy (8.5-9.9 kGy), whereas in round 2 a lower dose was delivered. However from table 2.3 it appears that the signal levels from the Rosemary sample using in blending were very close to the original reference values despite the dose difference, making it unlikely that dose response effects are responsible.

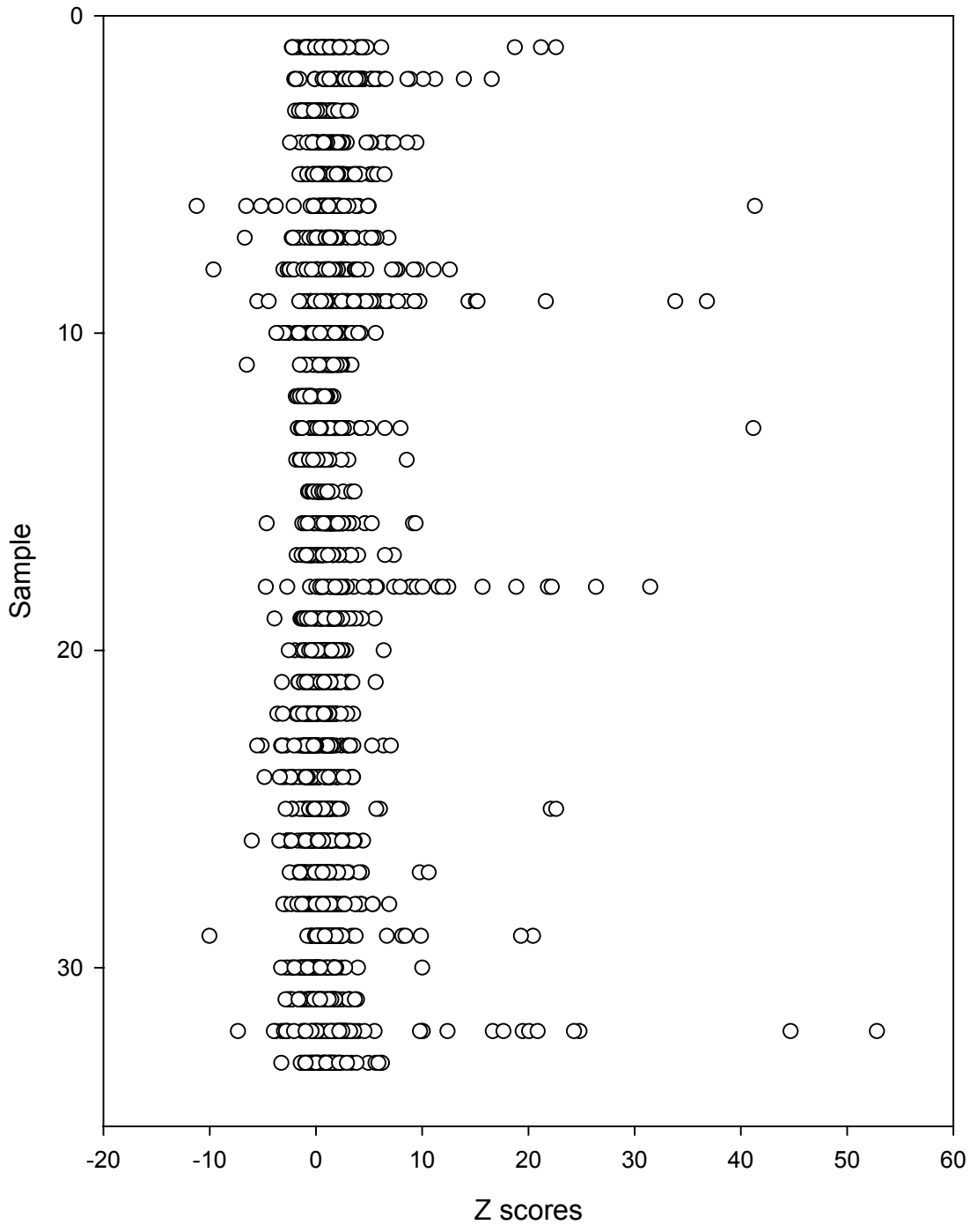


Figure 3.9 Participants' z-scores for unirradiated samples by sample

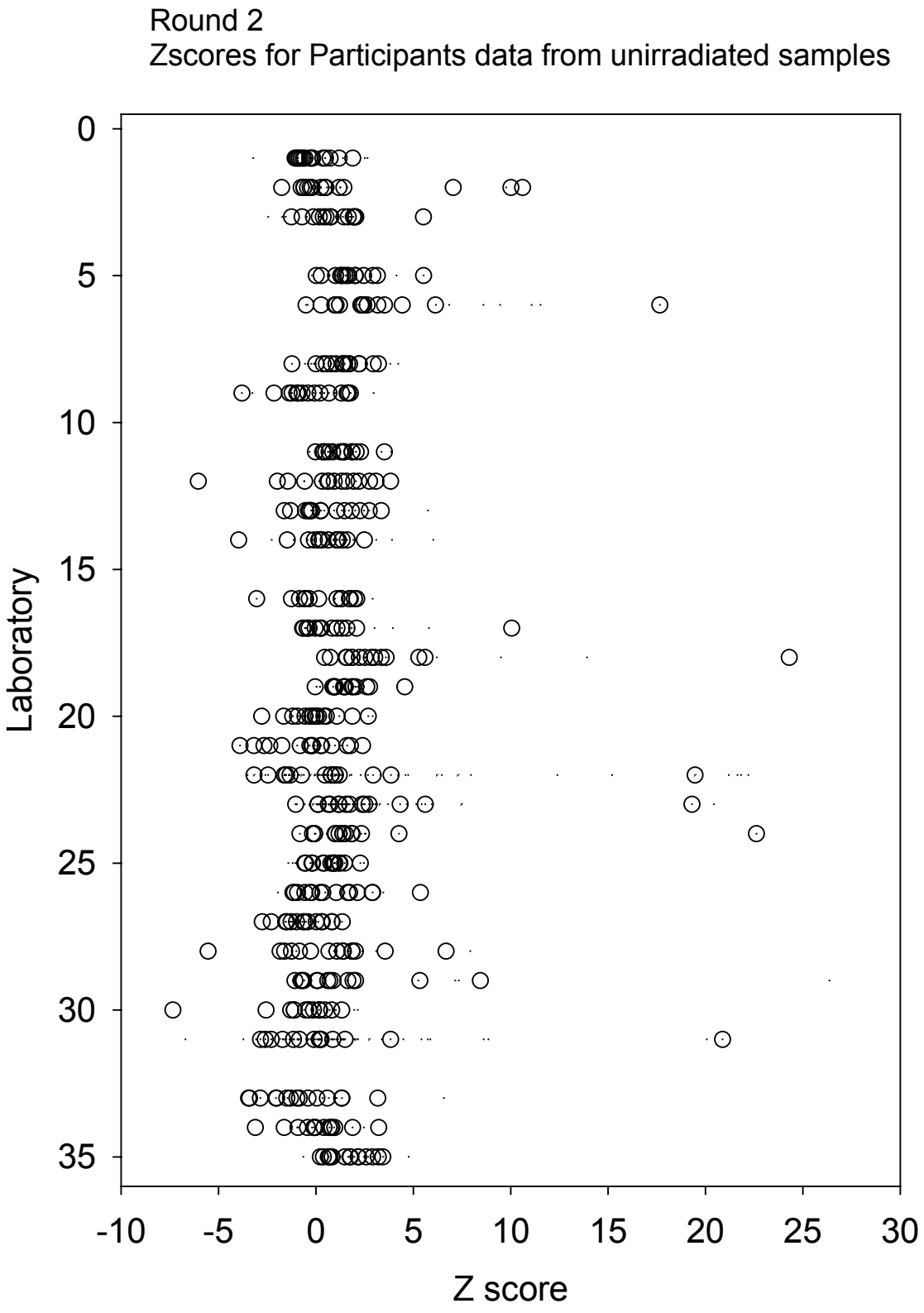


Figure 3.10 Participants' z-scores for unirradiated samples by laboratory

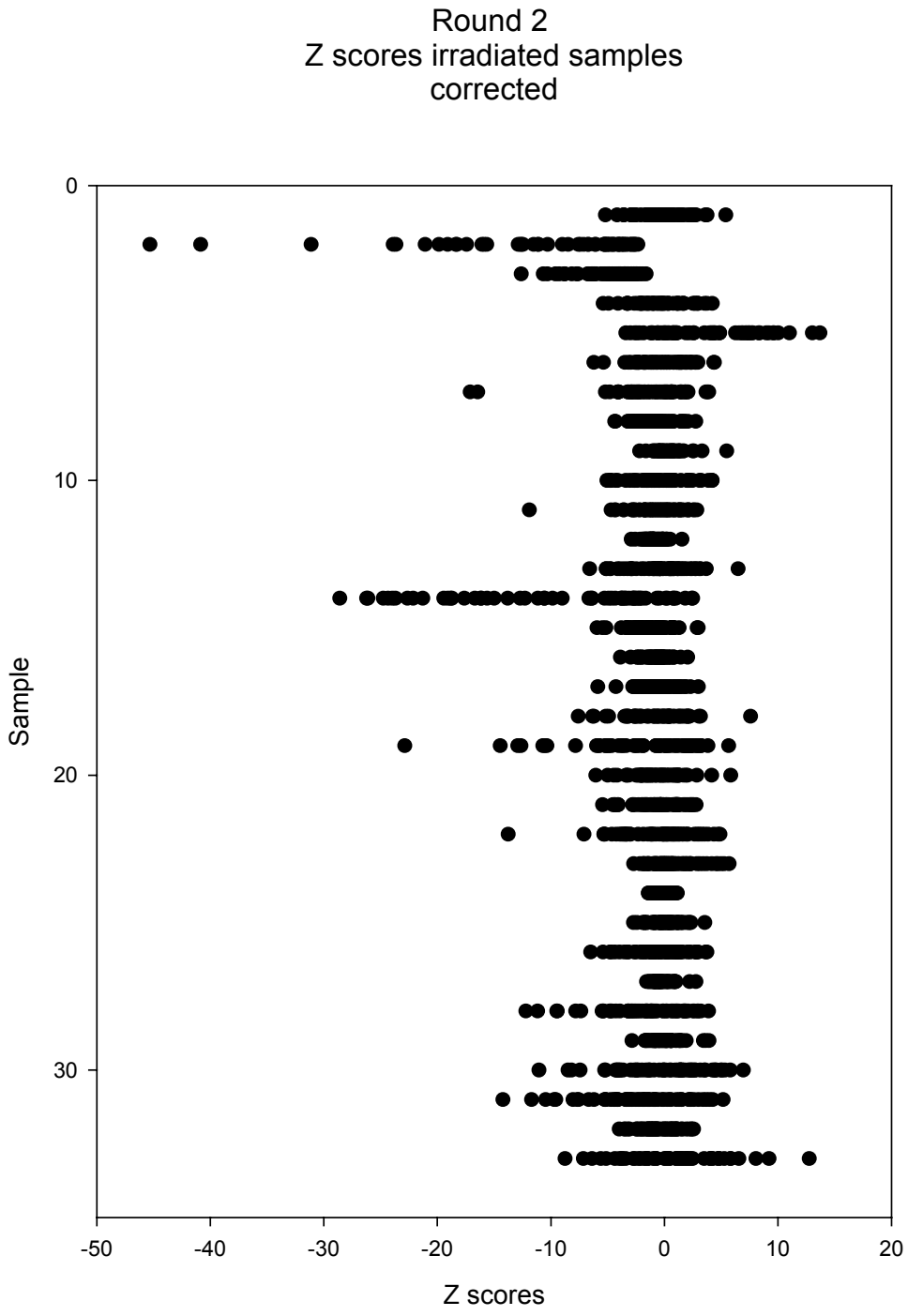


Figure 3.11 Participants' z-scores for irradiated samples by sample

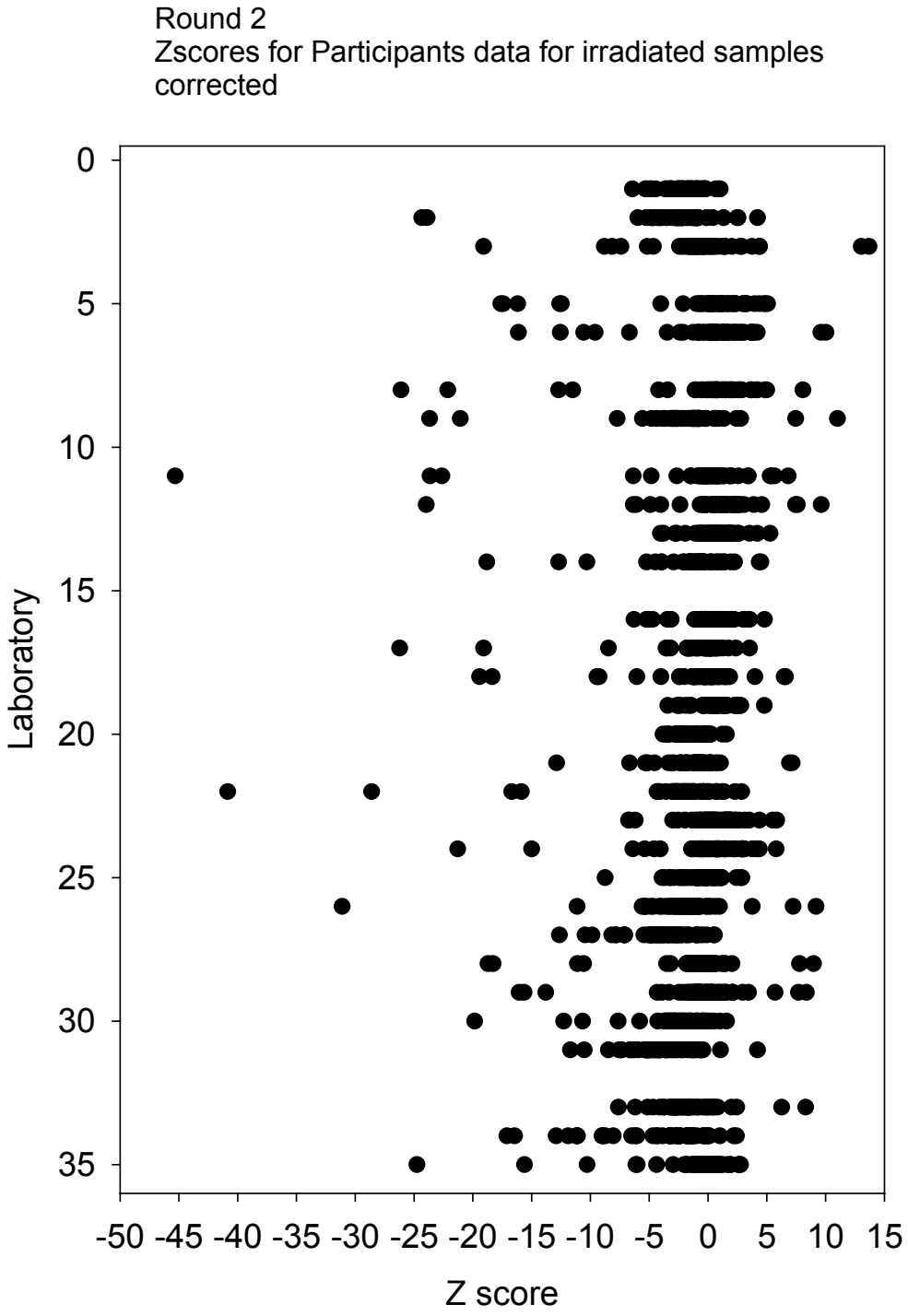


Figure 3.12 Participants' z-scores for irradiated samples by laboratory

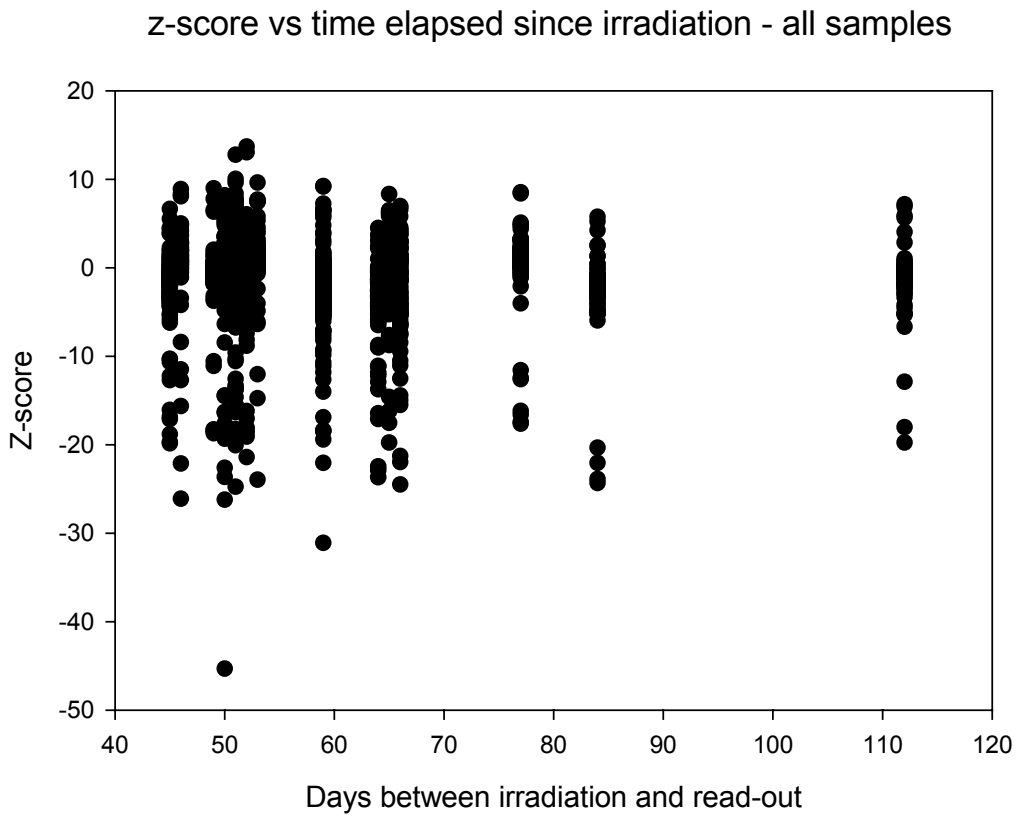


Figure 3.13 Time elapsed since irradiation vs z-score for all irradiated samples – participants' data

For the blends, displayed in figures 3.14 and 3.15, the data sets are quite well zero centred with only a very small number of outlying observations, which seem to occur randomly as far as dependence on sample or laboratory is concerned. There is no significant difference between samples, nor any marked dependence on the concentrations of the blends. From this it appears that the performance with the 6 blended samples was well matched between reference and participants' data sets.

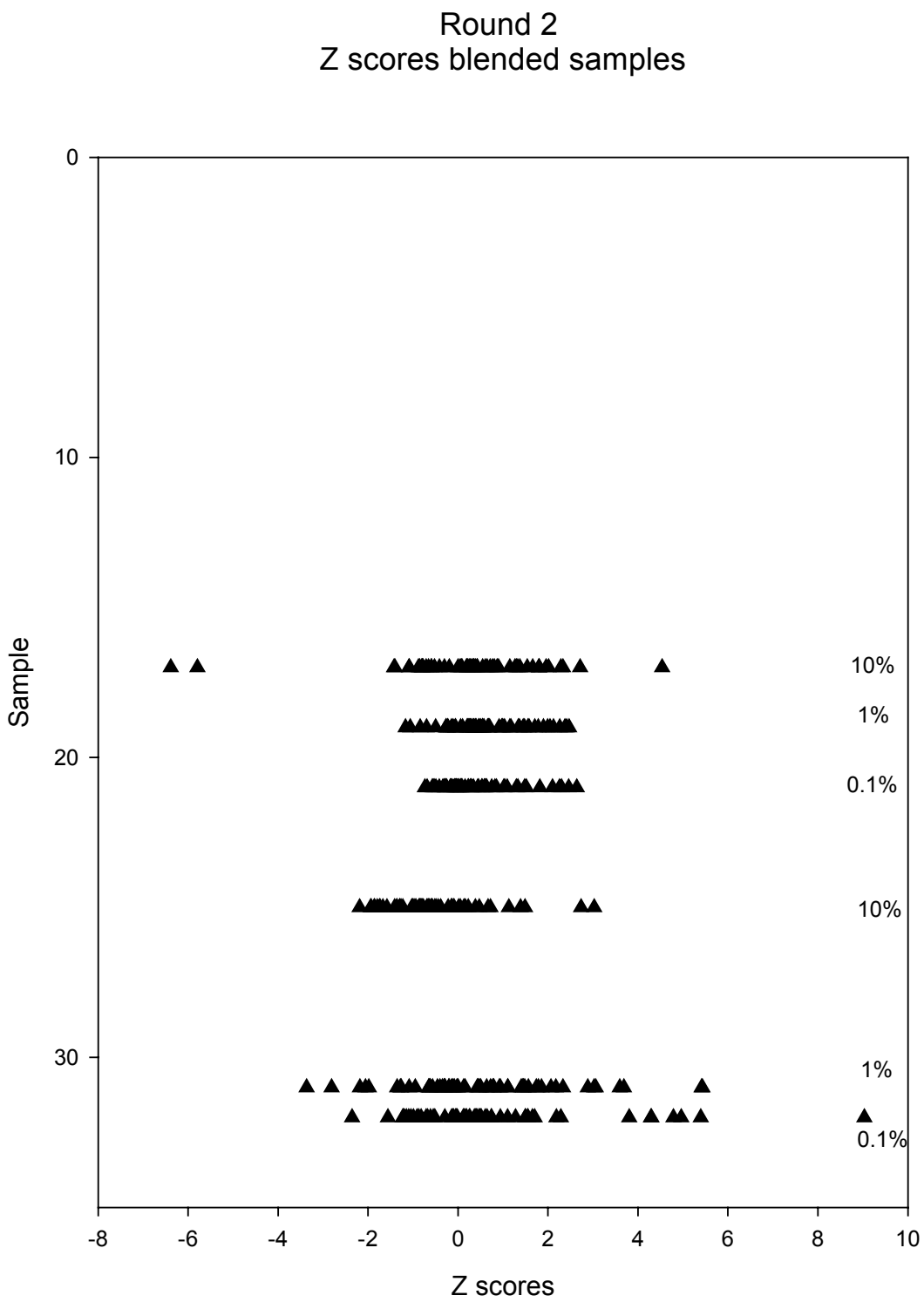


Figure 3.14 Participants' z-scores for blended samples by sample

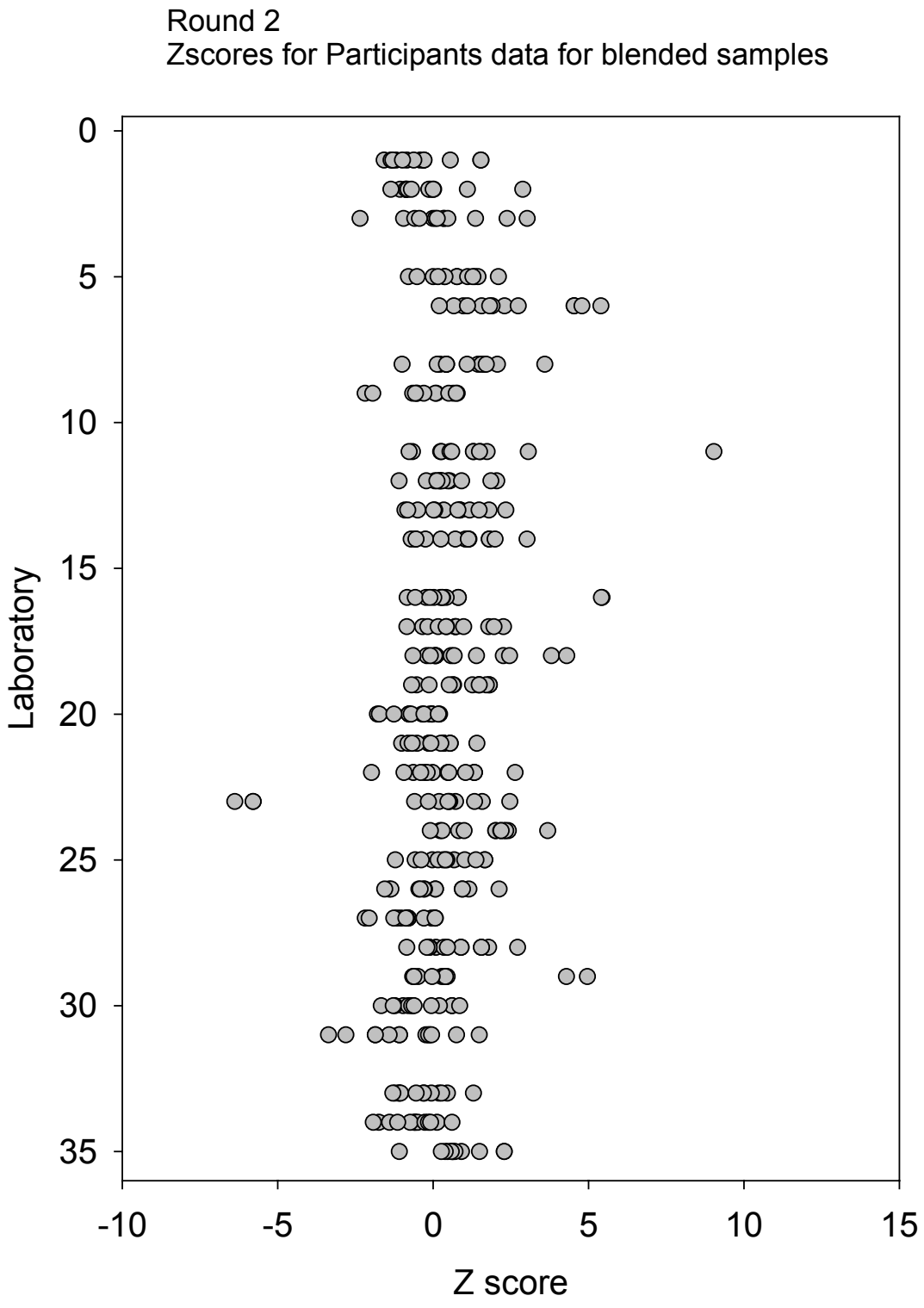


Figure 3.15 Participants' *z*-scores for blended samples by laboratory

Figures 3.16, 3.17 and 3.18 present participants *z*-scores in the form of 2-d colour contour plots. This forms of presentation permits visual identification of the interaction between test materials and participants with outlying results. Figure 3.16 confirms the observations concerning test material handling of unirradiated materials in the participants identified above and but does not indicate that any particular sample uniformly presented difficulties. In Figure 3.17 the irradiated test materials from three samples tended to be underestimated and two to

be overestimated. Figure 3.18, which shows the blended samples, indicates a more even distribution of results.

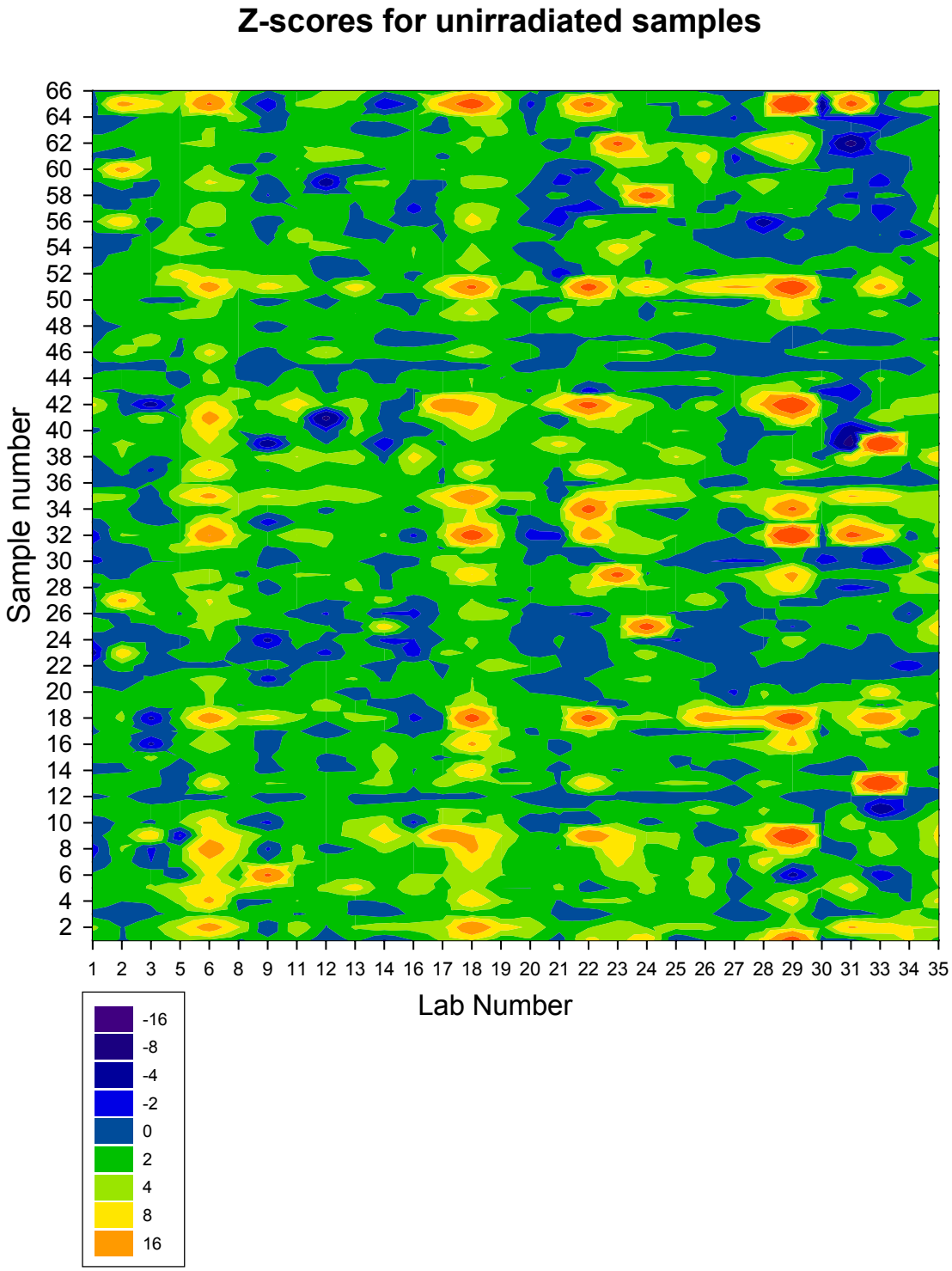


Figure 3.16 Contour plot for participants' data for unirradiated samples

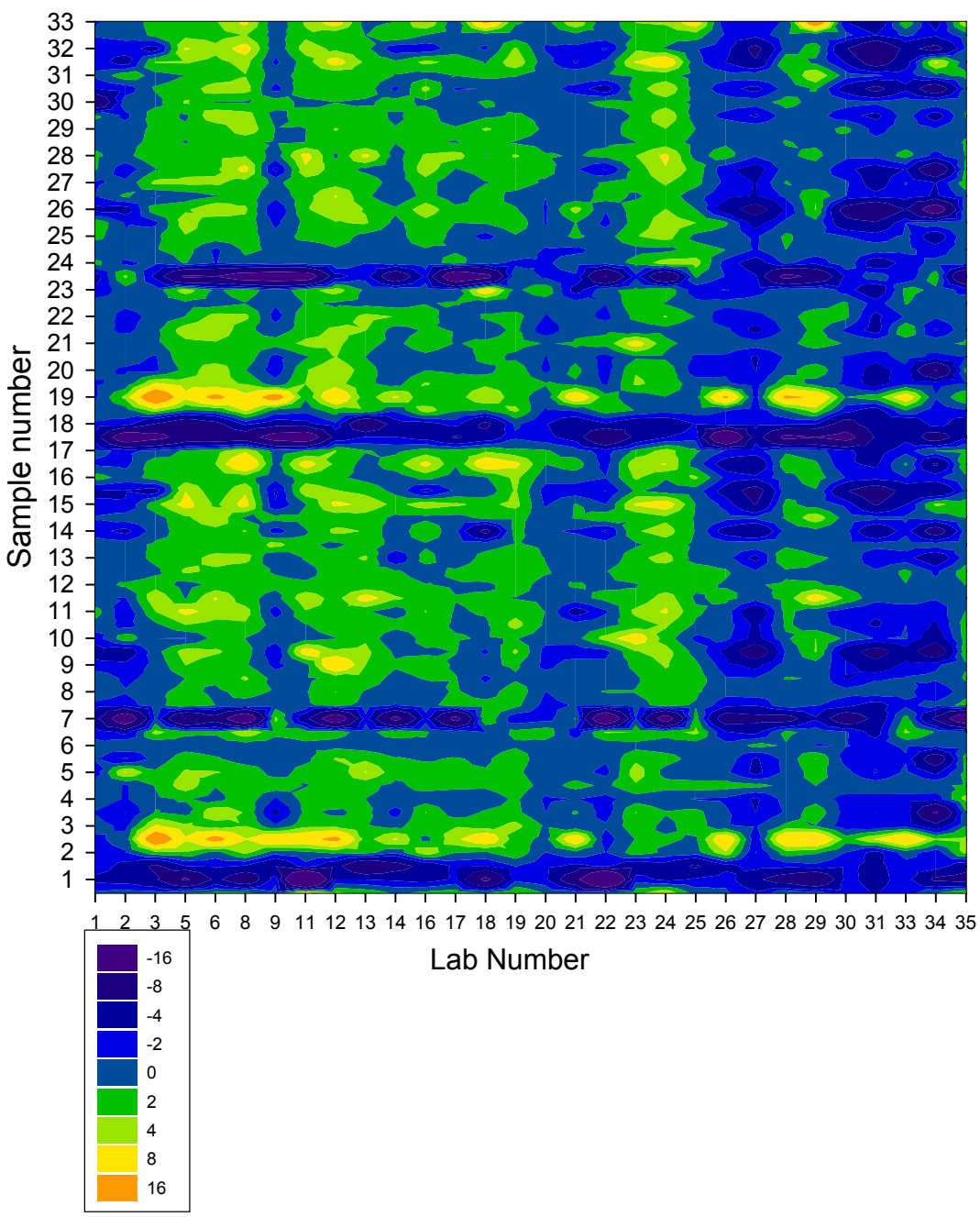


Figure 3.17 Contour plot for participants' data for irradiated samples

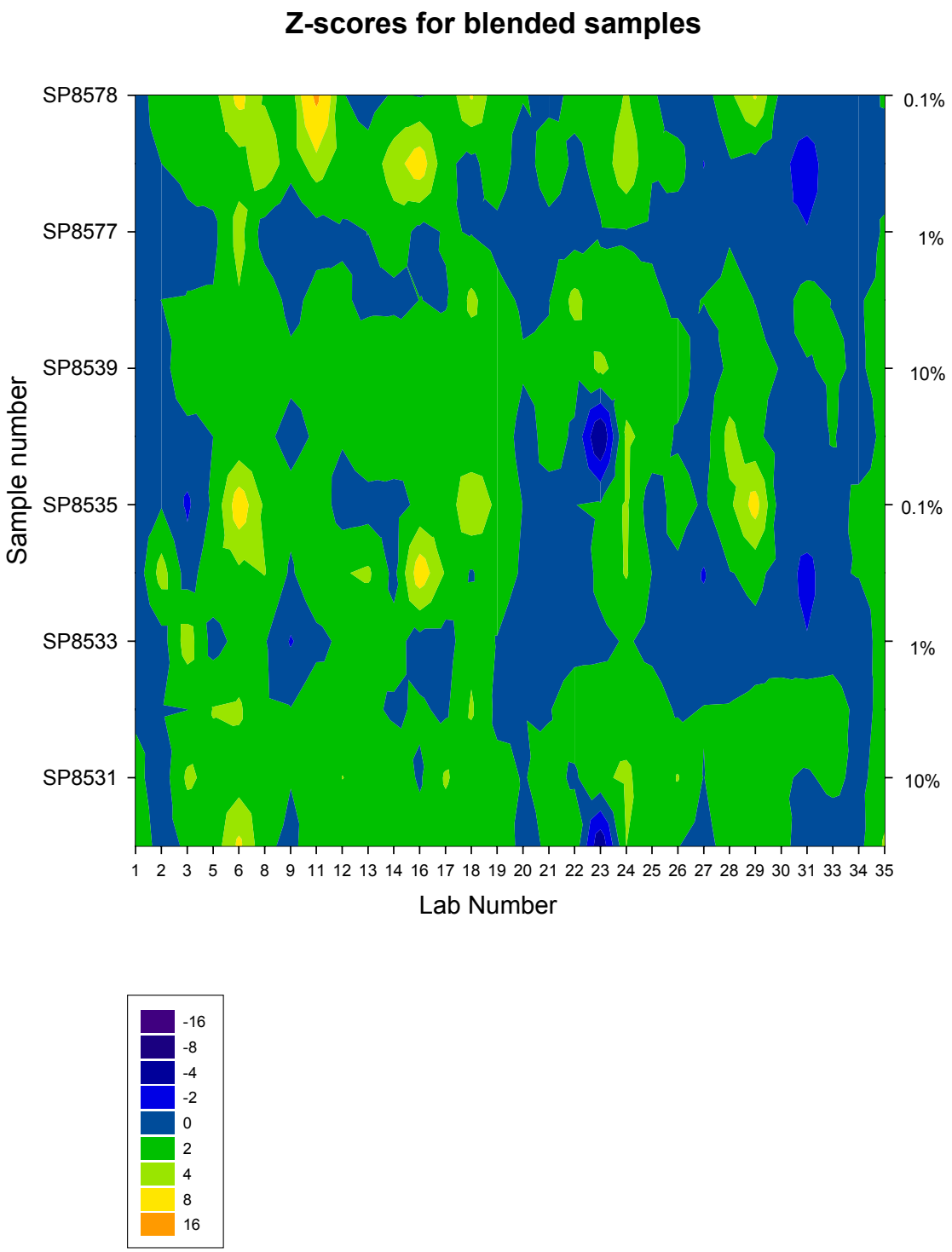


Figure 3.18 Contour plot for participants' data for blended samples

3.3.4 Qualitative Results

As with round 1, participants' results were classified into the 3 conventional screening bands (negative, intermediate and positive) using the two arbitrary threshold values (set at 700 and 5000 counts in keeping with BS EN 13751:2002) established during development of the method and in the validation studies. These threshold values do not take account of individual test material sensitivities, and therefore may be of limited applicability to matrices for which research or validation data are missing. Neither do they take account of individual instrument sensitivities and one potential opportunity furnished by this study would be to assess the benefits of standardising data sets prior to classification to results from the paprika reference standard or test material mean values prior to classification. At this stage however the qualitative outcomes are presented in descriptive form based on the data as received.

Table 3.14 shows these data tabulated by participant. Table 3.15 shows them by test material. Table 3.16 presents the qualitative outcomes of the reference data for the blends. Table 3.17 shows the qualitative outcomes from round 2 in comparison with those obtained from round 1 and reference data. Table 3.18 examines the results from blended samples as functions of concentration and the brightness of the material.

Overall the performance is again quite encouraging, with remarkably consistent performance from laboratories between the two rounds. As can be seen from table 3.17 in the present round 99.9% of irradiated samples fell into the intermediate or positive bands, compared with 99.7% in round 1. The proportions of unirradiated samples giving positive results has fallen very slightly to 2.3% from 2.8%. Both of these results represent slight improvements in performance between the two rounds, and again imply that the overall qualitative outcomes are relatively insensitive to the quantitative differences observed in the previous sections. For additional detail it is necessary to examine individual laboratory and sample performance.

Table 3.14 indicates that 2 laboratories (18 and 29) have still not overcome the cross-contamination problems they experienced in round 1 despite the randomised order of presentation, with a large number of positive results from the unirradiated samples. Laboratory 8 has greatly improved performance.

From Table 3.15 it is clear that there are some products (SP8514, SP8516, SP8536, SP8574 and SP8577) where the majority of observations for the unirradiated material fall into the intermediate band. This was also the case for these products in round 1, suggesting that the result is product-associated. There are also samples (SP8525, SP8531) where the negative/intermediate split is approximately even; again this repeats the round 1 observations. Two other products (SP8576, SP8578) have a significant number of intermediate observations, and this was also the case in round 1. Overall, however, 75% of observations from unirradiated samples are negative and 98% are either negative or intermediate. For the irradiated materials, four products (SP8530, SP8538, SP8573 and SP8575) are wholly or predominantly intermediate rather than positive. This was the same in round 1 for these products, reflecting their relatively low sensitivity to radiation. Overall, 99.9% of irradiated samples were identified as positive or intermediate.

For the blends it is not possible to compare with round 1. One of the 10% blends (SP8531) produced 95% positive outcomes, but the remainder were negative not intermediate. The other 10% blend (SP8539) produced 88% intermediate results. Neither of these products appears to be problematic in pure irradiated form, implying that the results for the blends are associated with the presence of a mixture of irradiated and unirradiated material. For the 1% blends, SP8533 produced 62% intermediate and 38% negative results and SP8577, which had elevated screening results in its unirradiated form, was 90% positive. With the concentration

of irradiated material at 0.1%, SP8535 (which again had almost as many intermediate results as negative for the unirradiated samples) has more intermediate than negative outcomes, whereas SP8578 is 87% negative. Table 3.18 examines the extent to which the outcomes can be related to the concentrations and brightnesses of the irradiated component in these samples. Once the expected signal levels, taken from table 2.4 are considered, the differences between the two examples in the 10% and 1% concentration blends become easier to understand. Thus the majority of results from the high sensitivity ginger sample at 10% concentration fall into the positive band, whereas the same concentration in tarragon leaves many results in the intermediate category. At 1% concentrations the high sensitivity ginseng produces many positive determinations, unlike the less sensitive rosemary. When all pairs are considered together however there is a noticeable trend in detection rate with increasing concentration. At 0.1% concentration 37.5% of blends would be selected for further investigation, on the basis of intermediate or positive screening, rising to 80.8% at 1% concentration and 95.8% at 10% concentration. On this basis it seems that both sensitivity and concentration are relevant in determining screening outcomes from blends. These blends mixed irradiated and unirradiated portions of the same product. In commercial applications where the brightness of minor irradiated components may differ from that of the matrix the situation may be more complex. Such scenarios were however studied under an earlier FSA/MAFF investigation of blending at SURRC.

Table 3.16 presents the homogeneity testing data for the same blends (10 aliquots of each). These show a similar pattern to the participants' results, with some evidence of a correlation between "unexpected" outcome and the coefficient of variance of the 10 results. This supports the conclusion that sample heterogeneity is a major factor.

Table 3.17 compares the participants' results with the round 1 data (from a larger number of samples measured as single aliquots) and with round 1 reference data. Again as in round 1, the correspondence between participants' and reference performance suggests that the slight quantitative underestimation implied by *z*-scores makes little difference in practice to qualitative outcomes at least for these test materials.

The unirradiated test materials still show a small proportion (c. 2%) of false positive band results in participant data sets that might be attributable to test material handling problems in certain laboratories (indeed the same laboratories in both rounds) and test materials. The main detrimental effect of elevated readings in unirradiated samples would be to select a greater proportion for other investigations than necessary which clearly represents a cost but does not necessarily lead to errors.

It should be noted that the qualitative outcomes tabulated below are based comparison between the reported terminal counts and the thresholds, as in round 1. A major difference in round 2 was the use of duplicate aliquots, with potential for conflict between classifications. Participants were asked to evaluate the outcomes of their screenings, but this was not done consistently. Those participants who did evaluate used a variety of approaches both to the evaluation and to dealing with different outcomes between aliquots; some returned a positive, intermediate or negative classification, some returned a decision as to whether the material was irradiated, some regarded samples with conflicting results for the two aliquots as inconclusive, some always chose the higher category, others chose a mixture of higher and lower, particularly for the subset of laboratories who used calibrated PSL to inform their decisions. The tables below treat the two aliquots from each sample as separate outcomes because of this variation in participant response.

Lab	Unirradiated			Irradiated			Blends		
	N	I	P	N	I	P	N	I	P
1	53	13	0	0	7	59	5	3	4
2	47	19	0	0	7	59	5	3	4
3	51	15	0	0	5	61	3	4	5
5	51	13	2	0	4	62	2	6	4
6	47	19	0	0	3	63	6	3	3
8	49	16	1	0	5	61	2	6	4
9	52	13	1	0	5	61	5	3	4
11	50	15	1	0	3	63	2	6	4
12	50	14	2	0	5	61	3	5	4
13	49	17	0	0	3	63	3	5	4
14	50	16	0	0	6	60	4	3	5
16	52	14	0	0	6	60	4	4	4
17	48	18	0	0	6	60	4	4	4
18	30	27	9	0	5	61	0	7	5
19	47	17	2	0	5	61	3	5	4
20	56	8	2	0	8	58	6	2	4
21	52	14	0	0	7	59	5	3	4
22	41	21	4	0	6	60	3	6	3
23	45	18	3	0	5	61	4	6	2
24	49	12	5	0	2	64	0	8	4
25	56	10	0	0	8	58	2	6	4
26	54	12	0	0	8	58	4	4	4
27	56	10	0	0	10	56	4	6	2
28	49	17	0	0	6	60	2	6	4
29	38	17	11	0	5	61	1	7	4
30	56	10	0	0	7	59	5	3	4
31	50	16	0	0	10	56	4	6	2
33	47	17	2	0	8	58	4	4	4
34	56	10	0	2	8	56	6	2	4
35	47	19	0	0	6	60	2	5	5
Total	1478	457	45	2	179	1799	103	141	116
Percentage	74.65%	23.08%	2.27%	0.10%	9.40%	89.24%	28.61%	39.17%	32.22%

Table 3.14 Participants' qualitative results by laboratory

	Unirradiated			Irradiated			Blends			
SP Number	N	I	P	N	I	P	SP Number	N	I	P
8512	56	1	3	0	0	60	8531(10%)	3	0	57
8513	52	7	1	0	0	60	8533 (1%)	22	38	0
8514	1	59	0	0	0	60	8535 (0.1%)	23	37	0
8515	54	6	0	0	2	58	8539 (10%)	2	53	5
8516	4	56	0	0	0	60	8577 (1%)	1	5	54
8517	54	4	2	0	0	60	8578 (0.1%)	52	8	0
8518	56	4	0	0	0	60	Total	103	141	116
8519	54	6	0	0	0	60	Percent	28.61	39.17	32.22
8520	51	7	2	0	0	60				
8521	60	0	0	0	0	60				
8523	60	0	0	0	0	60				
8525	29	31	0	0	0	60				
8526	55	4	1	0	0	60				
8528	57	3	0	0	0	60				
8529	57	3	0	0	0	60				
8530	58	2	0	2	58	0				
8531	27	30	3	0	0	60				
8532	40	14	6	0	0	60				
8533	60	0	0	0	0	60				
8534	59	1	0	0	4	60				
8535	33	27	0	0	0	60				
8536	3	48	9	0	0	60				
8538	57	3	0	0	40	20				
8539	60	0	0	0	0	60				
8571	56	2	2	0	0	60				
8572	59	1	0	0	0	60				
8573	58	2	0	0	44	16				
8574	2	57	1	0	0	60				
8575	54	4	2	0	31	29				
8576	49	11	0	0	0	60				
8577	1	49	10	0	0	60				
8578	47	10	3	0	0	60				
8579	55	5	0	0	0	60				
Total	1478	457	45	2	179	1799				
Percent	74.65	23.08	2.27	0.10	9.04	90.86				

Table 3.15 Participants' qualitative results by product

SP Number	Concentration	N	I	P	CV
8531	10%	0	0	10	6%
8533	1%	7	3	0	9%
8535	0.1%	6	4	0	10%
8539	10%	0	8	2	8%
8577	1%	0	0	10	4%
8578	0.1%	10	0	0	4%
Total		23	15	22	
Percent		38.33	25.00	36.67	

Table 3.16 Homogeneity testing for blends (screening) with coefficient of variance

	Irradiated Test Materials		Unirradiated Test Materials		Blended Test Materials	
	Neg	Pos / Int	Neg / Int	Pos	Neg	Pos / Int
Participants						
Round 2 Total	2	1978	1935	45	103	257
%	0.1	99.9	97.7	2.3	28.6	71.4
Round 1 Total	5	1514	1477	42		
%	0.3	99.7	97.2	2.8		
Reference Set						
%	0	490	489	1	23	37
Percent	0	100	99.8	0.2	38.3	61.7

Table 3.17 Comparison of participants' qualitative percentage with the reference set

Concentration	Sample	Product	Expected PSL[1]	Negative	Intermediate	Positive	Selected for investigation[2]
10%	SP8531	Ginger	36467	3	0	57	57
	SP8539	Tarragon	4696	2	53	5	58
			Total	5	53	62	115
			%	4.2	44.2	51.7	95.8
1%	SP8533	Rosemary	764	22	38	0	38
	SP8577	Ginseng	11342	1	5	54	59
			Total	23	43	54	97
			%	19.2	35.8	45.0	80.8
0.10%	SP8535	Chilli	145	23	37	0	37
	SP8578	Green Tea	116	52	8	0	8
				75	45	0	45
				62.5	37.5	0	37.5
All blends			Total	103	141	116	257
			%	28.6	39.2	32.2	71.4

Table 3.18 PSL screening results from the blended samples by concentration and brightness. 1. Expected PSL signals in photon counts from table 2.4. 2. The numbers which would be selected for further investigation under EN13751, ie the sum of intermediate and positive outcomes.

4. CALIBRATED PSL

4.1 Calibrated PSL Homogeneity Testing

Round 2 introduced calibrated PSL measurements for those laboratories able to irradiate their material. 12 of the screening laboratories participated in this part of the trial. To provide reference data for comparison with these extra results, calibrated PSL homogeneity testing was carried out at SUERC in July and August 2006.

All the petri dishes from the 2005 homogeneity testing, including those products not sent to participants for round 2, plus those used for the blends, were given a dose of 1kGy at Isotron and re-read. This provided reference data comparable with participants' calibrated measurements and with the homogeneity testing for the screening.

4.2 Homogeneity Testing Results

The PSL terminal counts for the calibrated measurements are fully tabulated in Appendix B. Figure 4. 1 presents the data as a scatter plot with initial PSL against calibrated PSL; the data show good separation of irradiated and unirradiated products, with the blends overlapping both categories as expected.

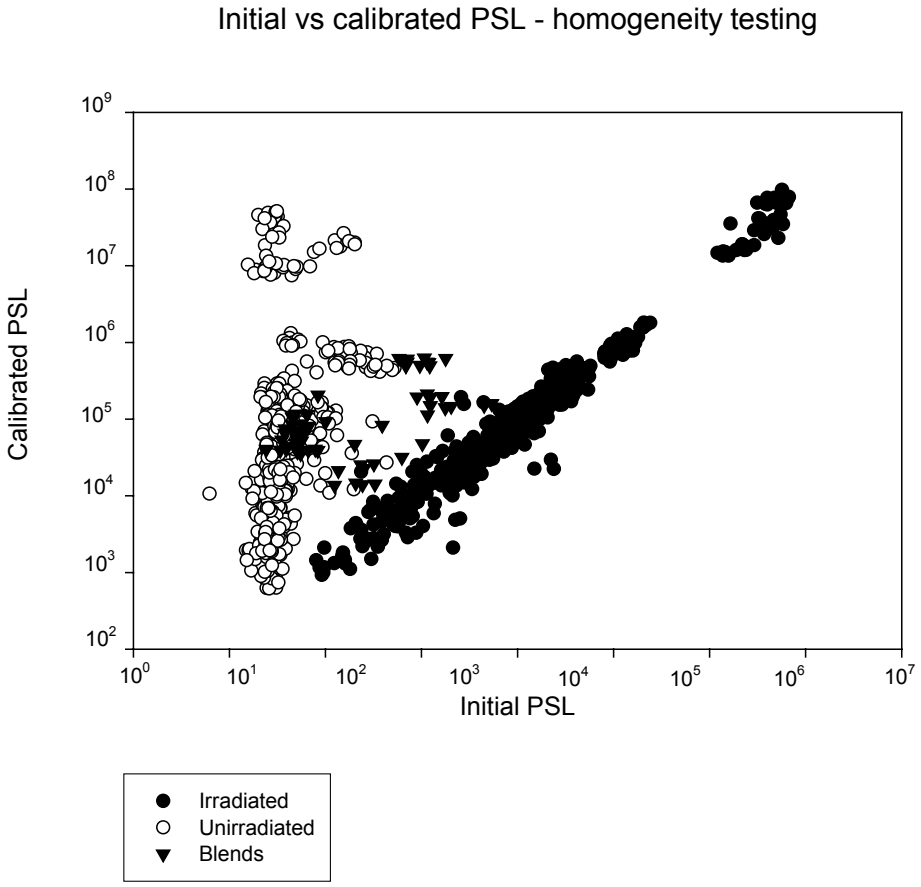


Figure 4.1 Initial vs calibrated PSL for reference materials

4.3 Participants' Results

Participants were asked to return their classification data, PSL terminal counts, summary and raw data files, as for the screening. Some participants indicated that they had re-dispensed material to be irradiated, rather than sealing the petri-dishes used for screening and re-measuring the same material after irradiation. For some laboratories it is not clear which procedure was followed (the calibrated homogeneity testing was performed on the screened material) and neither is it clear whether the thick or thin methods of preparation were used. For each of the 12 laboratories which returned calibrated data, a plot equivalent to Figure 4.1 was produced. These are displayed below as Figures 4.2 – 4.5. Full data are in Appendix C.

Table 4.1 shows the type of source used by participants, where this was stated in their returns. It also shows whether they used the information obtained from the second measurement to inform their judgment about the samples.

Laboratory	Type of source	Whether used calibrated results to evaluate	
1	^{60}Co	Y	
14	X-ray 60kV 0.2mm Al filter	Y	
17	10 MeV LINAC	Y	
18	^{60}Co		N
19	^{60}Co	Y	
23	^{60}Co	Y	
24	^{60}Co		N
25	^{60}Co		N
26	^{60}Co		N
27	Not stated		N
28	Not stated	Y	
35	^{60}Co	Y	

Table 4.1 Type of source used for calibration by participants and whether they utilised the second data set to evaluate

From figures 4.2 to 4.5 it can be seen that the overall scatter distribution for the participants is very similar to that for the reference data. The small cluster of results with high initial PSL (salt-containing materials) has been distinguished by almost all the participants, and most have the irradiated samples clustering along a gradient. Laboratory 18 is an exception to this, with a much more diffuse pattern; this laboratory has already been seen to have a sample-handling issue. Laboratory 14 also shows a slightly more random distribution for the irradiated samples, and laboratory 17 appears to have the least dispersed data set from irradiated samples of all laboratories, including the reference laboratory. When the source types used are considered in combination with these data it appears that the quality of the calibrated relationship may depend on the irradiation facility used. For laboratories utilising ^{60}Co sources the data appear to be very similar to the reference set, which was re-irradiated remotely using the Isotron commercial ^{60}Co facility. Laboratory 17 used an in-house LINAC, which apparently results in a very well controlled dose distribution from sample to sample, reflecting in high quality calibrated PSL data. The x-ray system used by laboratory 14 appears to have generated additional scatter. It would be useful to assess the extent to which these findings are generic to their respective technologies in future work. It is also noted that the evaluation methods differed between participants, and that for these samples there were rather few cases where screening results from low-sensitivity irradiated samples might have been re-interpreted following the calibrated response.

The use of z-scores was not considered appropriate here. Each participant was responsible for the necessary irradiation; dose and the time elapsed between irradiation and read-out have not been assessed. Figure 3.9 above implies that time elapsed will not be important within the time-scale of the study. Since it is unclear to what extent the availability of calibrated results affected participants' evaluation of outcome (some indicated that they had taken it into account; in some other cases this is implicit), qualitative tables have not been prepared at this stage. Nevertheless, it is clear that overall performance was good, irradiations having been performed and repeat measurements conducted successfully. Further analyses of these data may prove informative in the future.

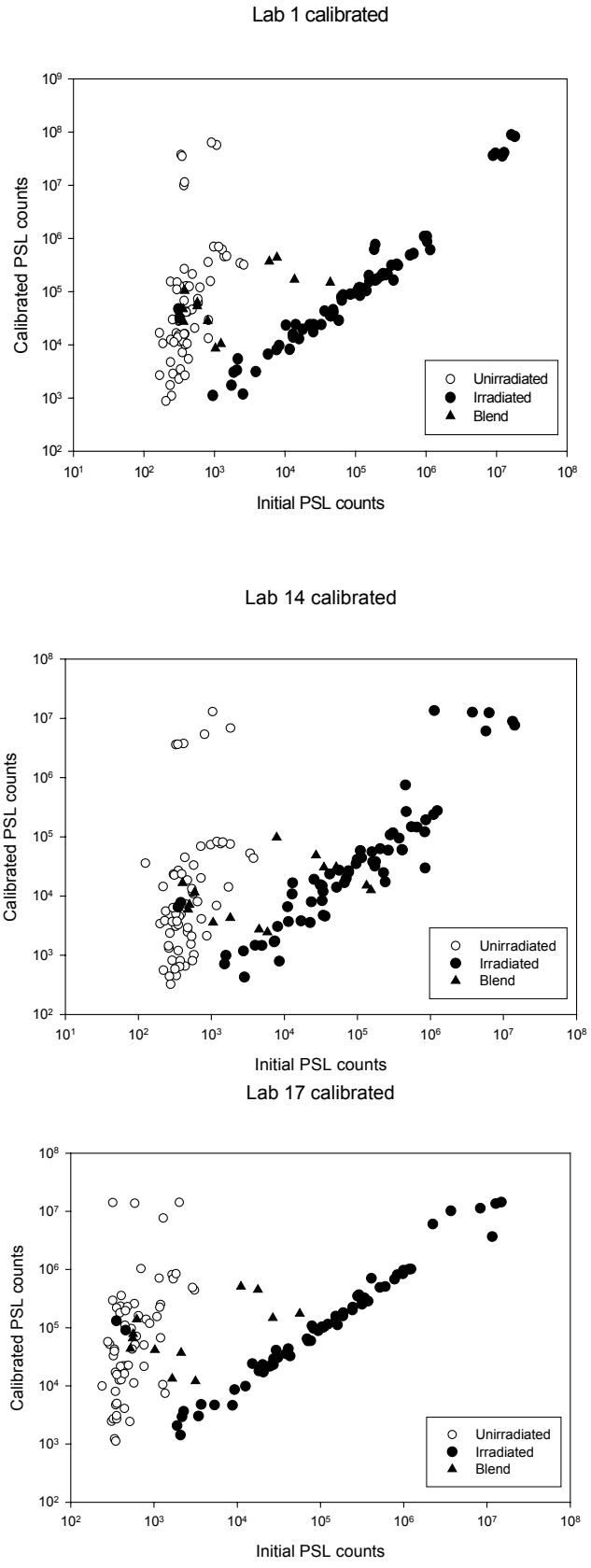
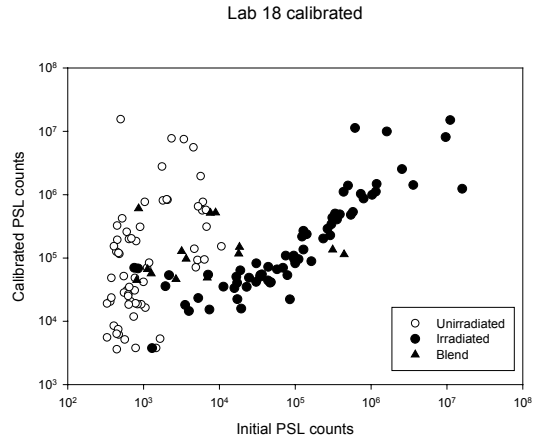
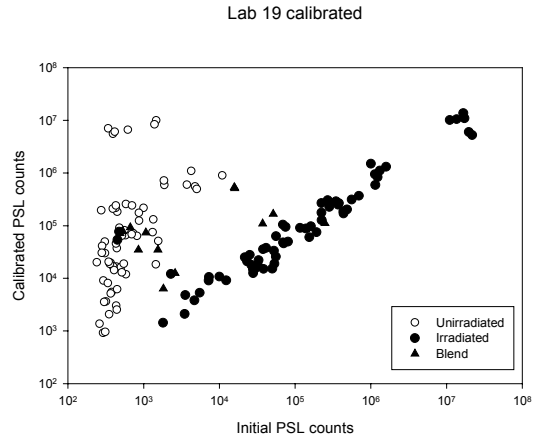


Figure 4.2 Initial vs calibrated PSL for laboratories 1, 14 and 17





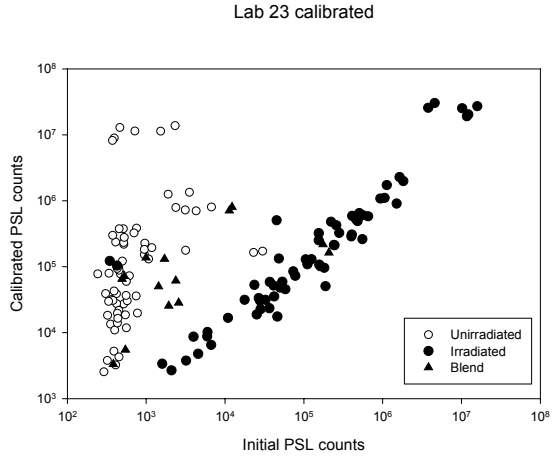


Figure 4.3 Initial vs calibrated PSL for laboratories 18, 19 and 23

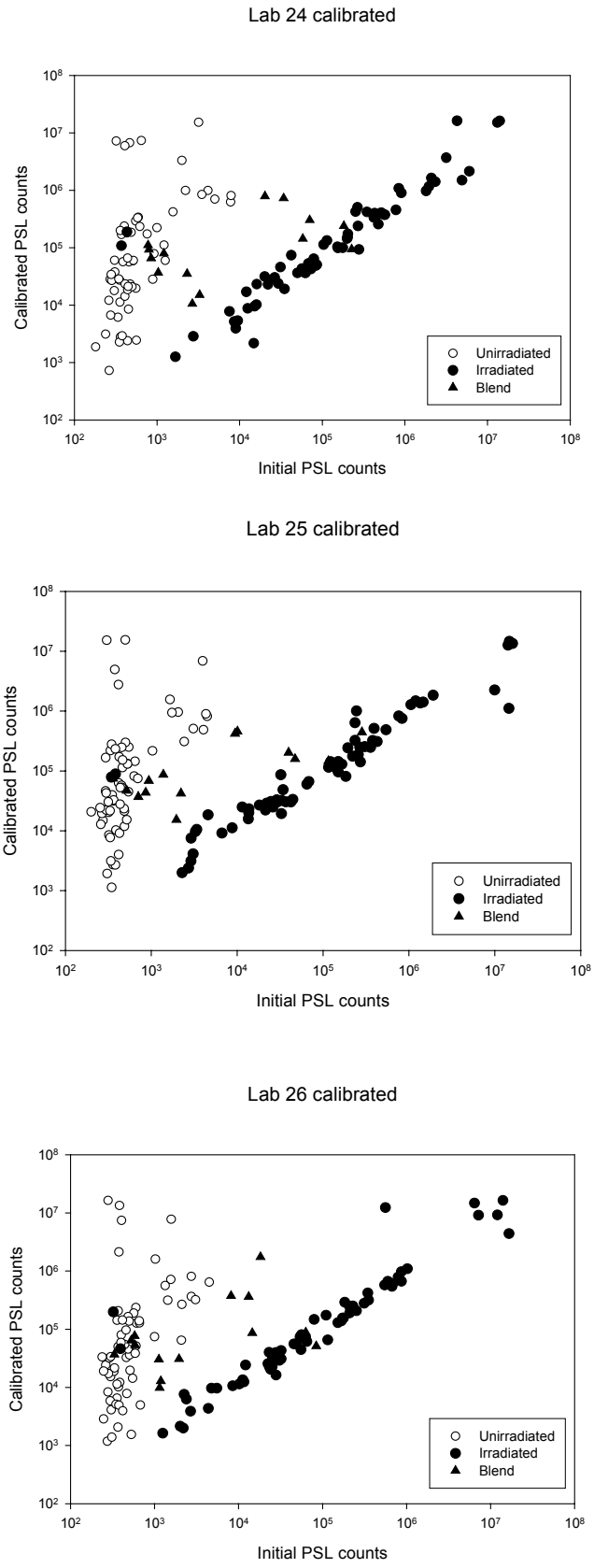
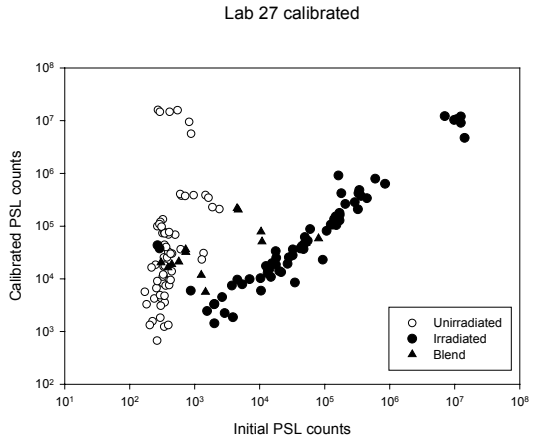
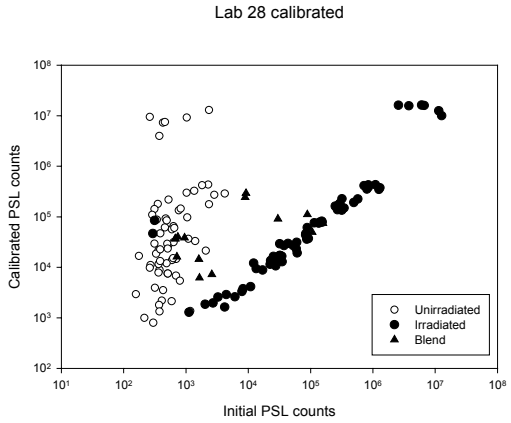


Figure 4.4 Initial vs calibrated PSL for laboratories 24, 25 and 26





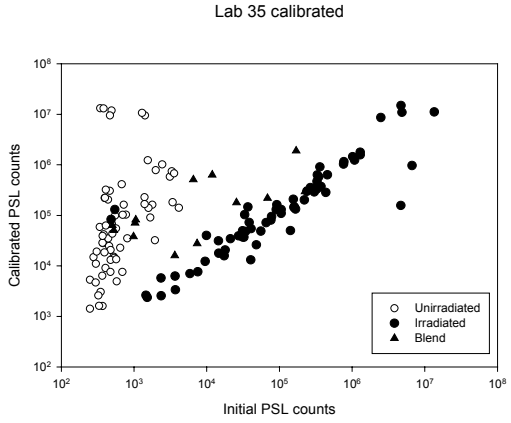


Figure 4.5 Initial vs calibrated PSL for laboratories 27, 28 and 35

5. THERMOLUMINESCENCE ANALYSIS

5.1 TL Homogeneity Testing

Homogeneity testing was conducted at SUERC on randomly selected excess material from that prepared for distribution to participants, to characterise the TL response and assess the intrinsic variability of all samples within one laboratory. For irradiated and unirradiated products sent to participants, 2 discs were prepared from each of 10 pots; 20 discs were prepared from each of the blended materials. (Previously, 2 discs of each of the unirradiated products as originally purchased had been analysed to determine whether there was any evidence that they contained irradiated components.) To ensure that there was no cross-contamination between irradiated, unirradiated and blended samples, the unirradiated products were separated and read out first, then the irradiated and finally the blended products; the procedure was carried out with the usual quality assurance steps using process and glassware blanks.

5.2 TL Homogeneity Testing Results

EN1788 calls for TL quantification of glow 1 signals, glow 2 signals, the glow ratio and identification of whether or not a peak can be observed in the 150-250°C region. Where glow 2 intensities are less than 10 times the laboratory minimum detectable level, defined by the mean and 3 standard deviations of full-process blanks the mineral yield is considered unsatisfactory. An additional criterion for use in UK surveys, which has yet to be added to EN1788, was introduced in 2001 which requires any sample where the presence of irradiated material has been identified on the basis of a low temperature peak in glow 1 to have intensity which exceeds the minimum detectable level.

The reference laboratory routinely checks temperature calibration using encapsulated natural CaF_2 grains and monitoring the positions of 3 well characterised TL peaks. This material presents the grains in a manner which more closely resembles the thermal contact of the minerals extracted from food samples than the 0.8 mm LiF chips suggested in the EN1788 annexe, and does not require the complex annealing cycle of LiF. In this study however LiF chips were prepared and distributed, since participants would be more familiar with this approach. The reference laboratory obtained peak V temperature estimates of 249,250,250, and 251 °C from 4 retained LiF chips from the same batch as those distributed in pairs to participants. An additional 6 chips drawn from a new batch of LiF obtained from Thermo-electron for possible use in later trial rounds was also measured at SUERC, giving values of 250,251,249,248,251 and 249 °C, in July 2006. It was concluded that the temperature control of the SURRC reader used gave a mean value of 250±1°C for peak V during this phase of the study. In earlier interlaboratory trials, between 1991 and 1995, the SURRC reader had given results between 245°C and 258°C with paired reproducibility of <5°C, which compared with other laboratories peak V temperature range estimates from 190-328°C, with paired reproducibility of up to 30°C[23]. Given the importance of identifying the presence of peaks in the 150-250°C region, particularly for blended mixtures, temperature control accuracy and precision remains of concern to TL analysis.

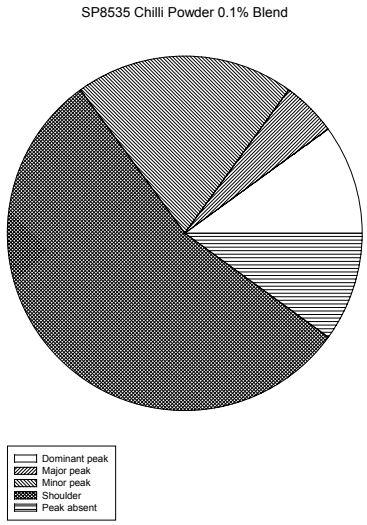
23. Sanderson D.C.W, Carmichael L.A., Naylor J.D., 1996, Establishing Luminescence Detection Metrhods for Irradiated Fruits, Vegetables and Shellfish, MAFF Project 1B073, Third Report, SURRC, East Kilbride.p8-12

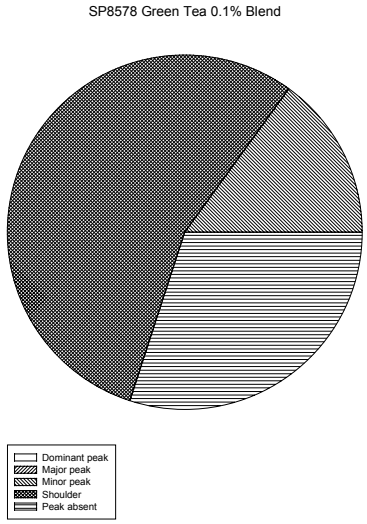
A further distinction which has been used in the reference laboratory to help to describe the nature of low temperature peak evidence is to note the general shape of the glow 1 peak, with respect to signals in the 150-250°C region. In these terms a "dominant" peak is the main signal in glow 1, a "major" peak describes the largest signal, although other similar signals may also occur at higher temperatures due to geological residuals, a "minor" peak means that there are larger higher temperature signals in the glow curve than the low temperature peak, and a "shoulder" is a small inflected signal component. If no signal is present the term "absent" is used. These descriptions have been used in UK surveys, although they are not in general international use. The peak shape descriptors of the reference analysis are discussed below for information.

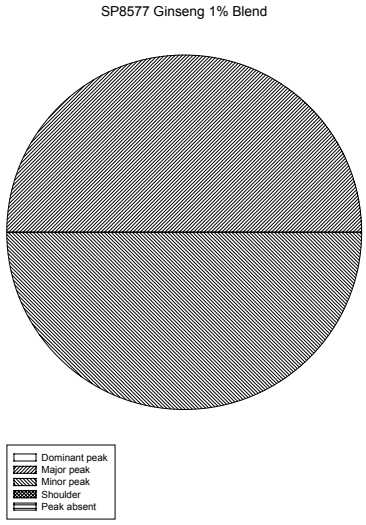
All the irradiated materials showed "dominant" G1 peaks in the 150-250°C range. For the unirradiated materials with the exception of SP8539 Tarragon, peaks in this range were "absent". In the case of SP8539 a low temperature signal in glow 1 was noted in 11 out of the 20 aliquots, which implies, according to EN1788, the presence of irradiated material before treatment. For the blends, results were more mixed, as might be expected. The 10% blends (SP8531 Ginger and SP8539) and one of the 1% blends (SP8533 Rosemary) showed "dominant" G1 peaks in all aliquots. The other blends (SP8577 Ginseng at 1% and 0.1% blends SP8535 Chilli powder and SP8578 Green tea) produced a range of G1 glow shapes. The distribution of these shapes for 20 aliquots is shown in Figure 5.1. As can be seen the 1% Ginseng sample shows both "major" and "minor" peaks in equal proportions. At 0.1% the Green Tea samples shows a significant proportion of "absent" outcomes; more than 50% of analyses have produced "shoulders" with a number of aliquots giving "minor" signals. The other 0.1% concentration blend produces a mixture of "shoulder", "minor", "major" and "dominant" in most cases.

Figures 5.2-5.4 are scatter plots of glow 1 against glow 2 log intensities (integrated for 220°-240°C) for each product, with the three irradiation categories indicated by different symbols. These plots show complete separation of irradiated and unirradiated materials. For the blends, the degree of separation varies. The 10% and 1% blends the blended results occupy a discrete area, whereas for the 0.1% the blended and unirradiated samples overlap. This is consistent with the glow shapes described above, but underlines the importance of utilising glow shape information at low concentrations. Figures 5.5-5.7 plot glow ratio for the same temperature interval, again showing very good discrimination between irradiated and unirradiated samples, with concentration dependence in the glow ratios from blends. Table B.7 in Appendix B summarises the reference values of glow ratio.

Figure 5.1 Distribution of glow 1 peak shapes for 20 aliquots each of 3 blends







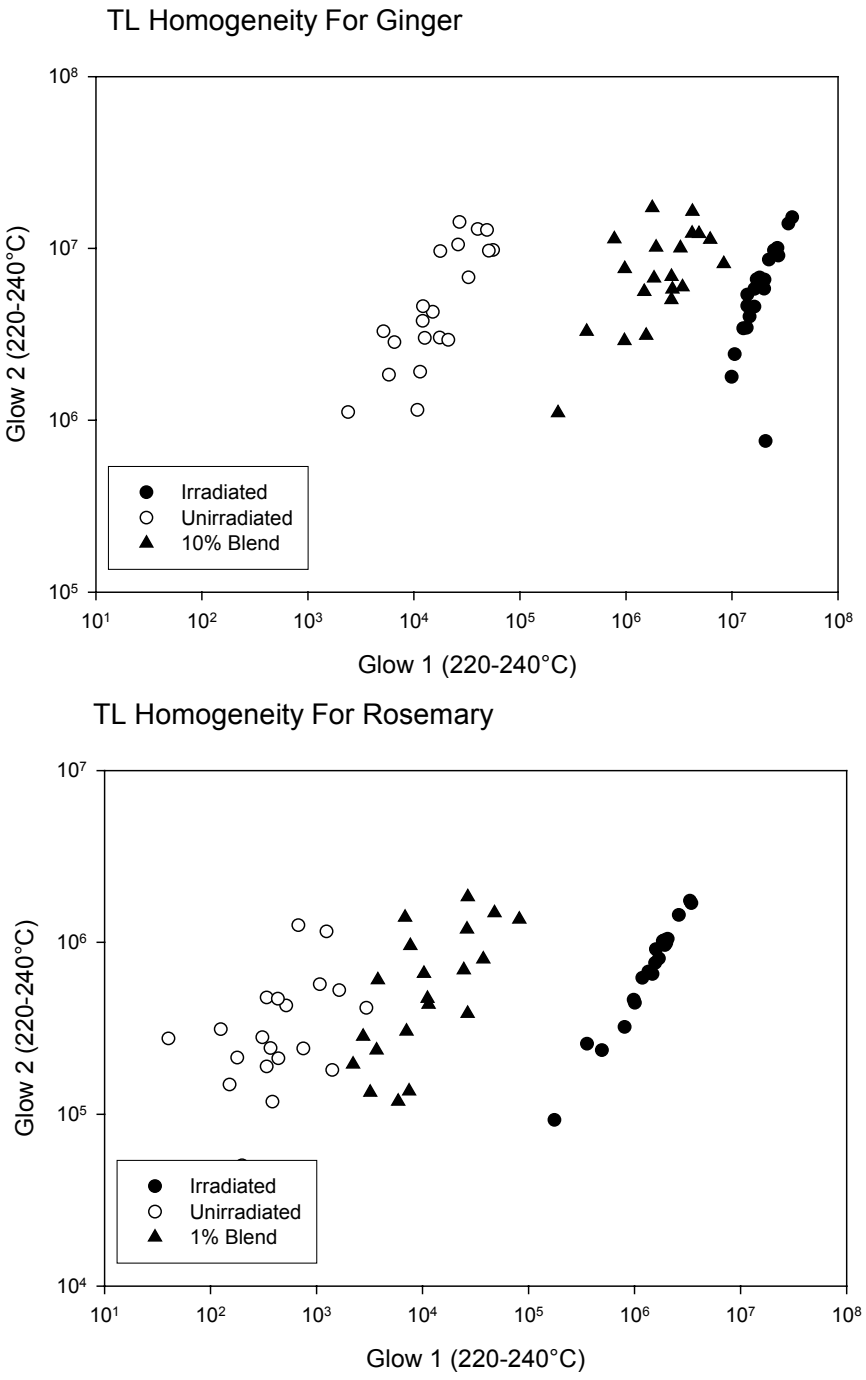


Figure 5.2 TL homogeneity testing glow 1 vs glow 2 scatter plot for SP8531 and SP8533

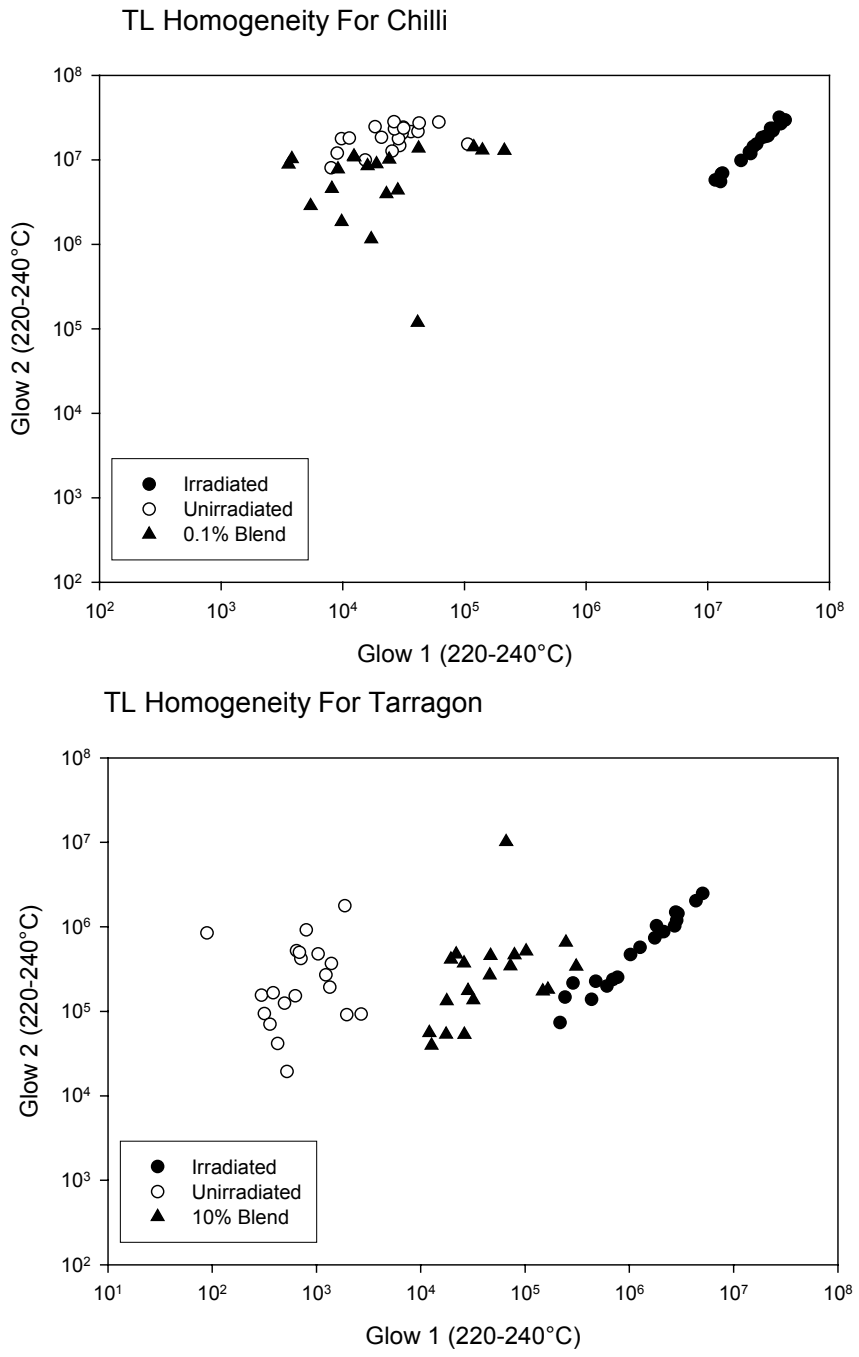


Figure 5.3 TL homogeneity testing glow 1 vs glow 2 scatter plot for SP8535 and SP8539

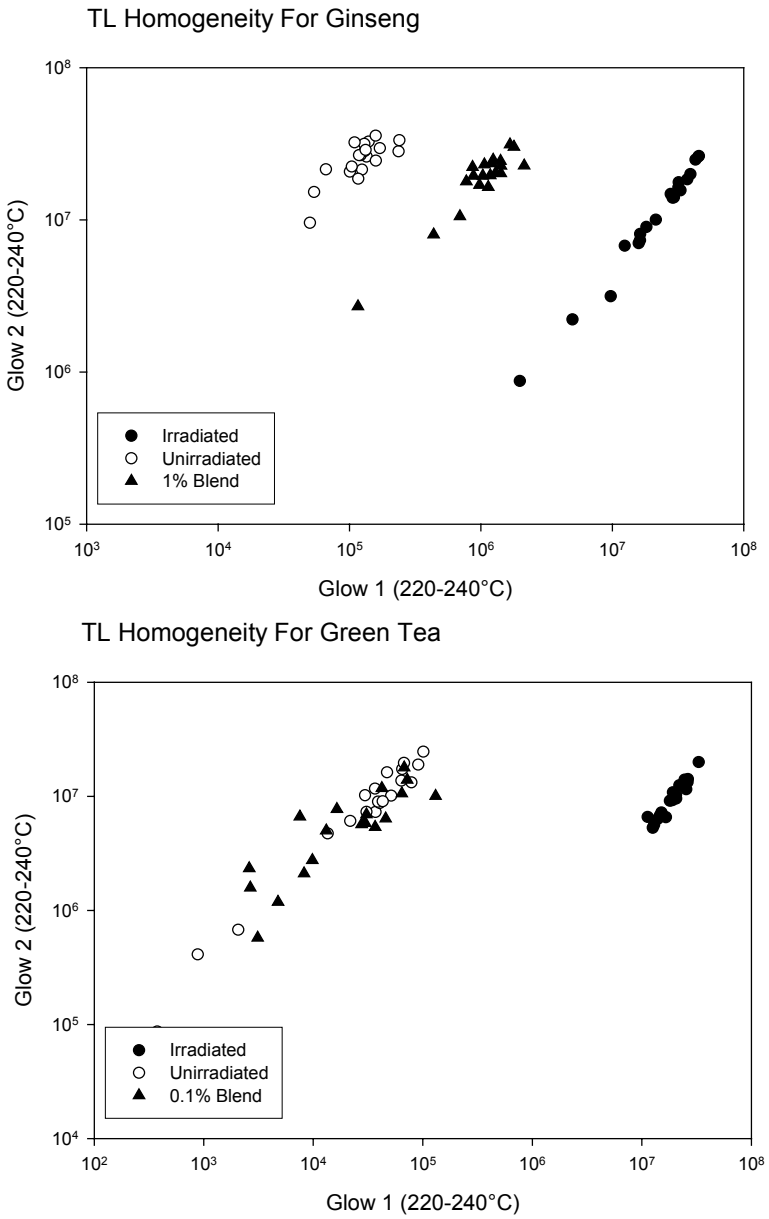
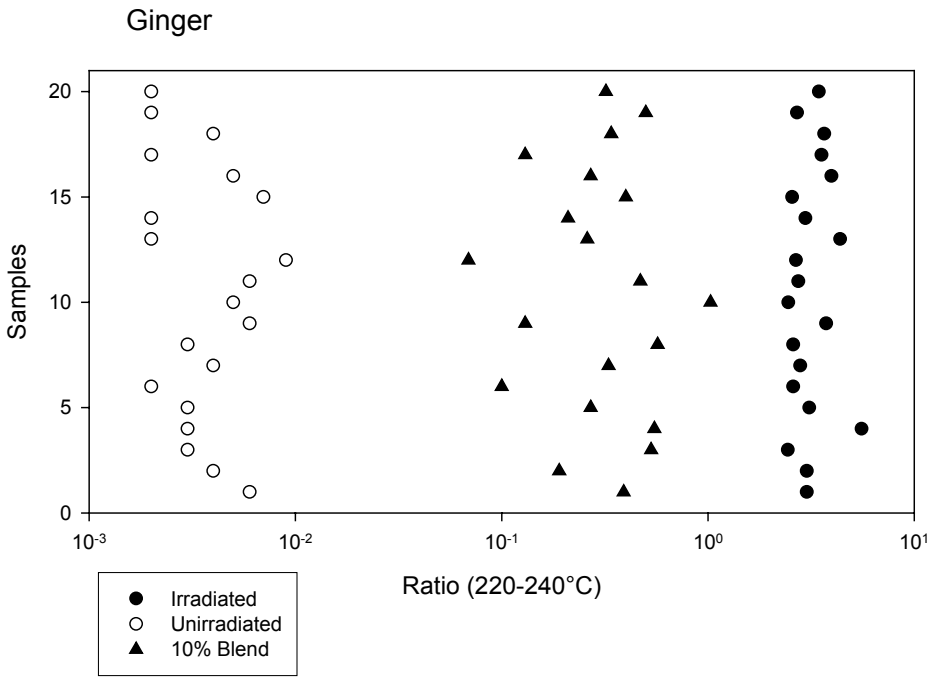


Figure 5.4 TL homogeneity testing glow 1 vs glow 2 scatter plot for SP8577 and SP8578



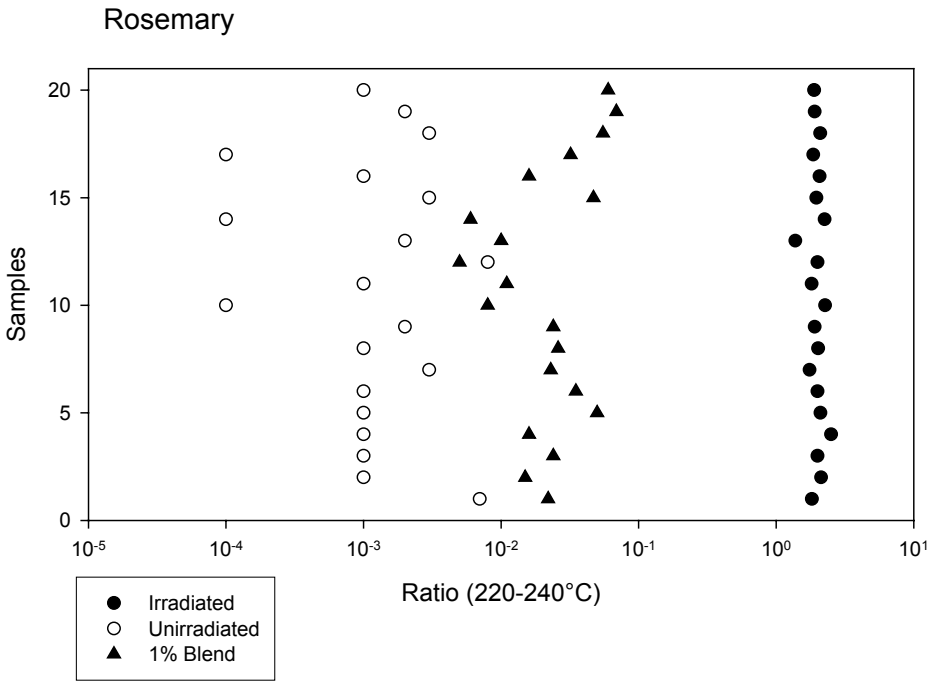


Figure 5.5 TL homogeneity testing glow ratio plot for SP8531 and SP8533

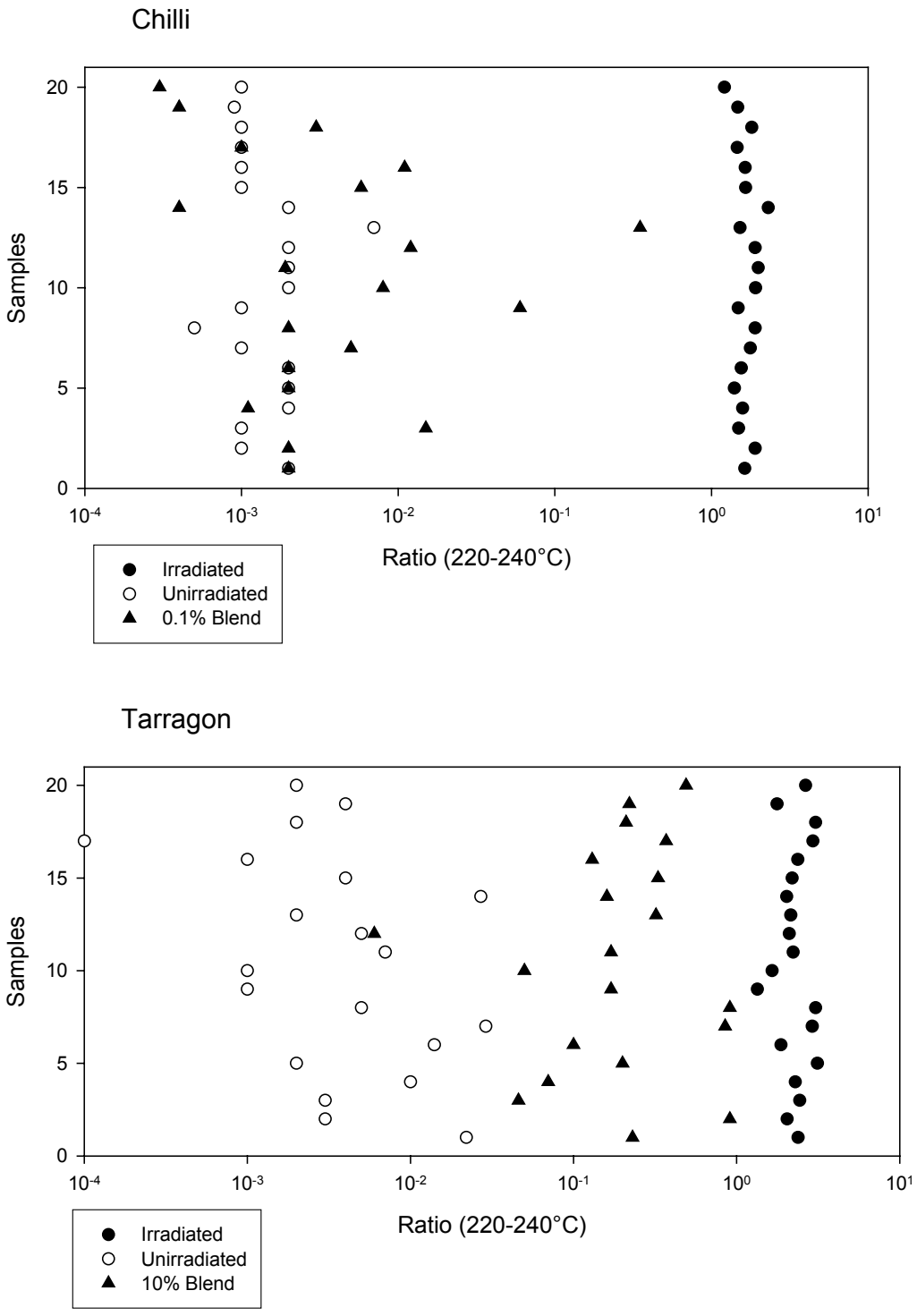


Figure 5.6 TL homogeneity testing glow ratio plot for SP8535 and SP8539

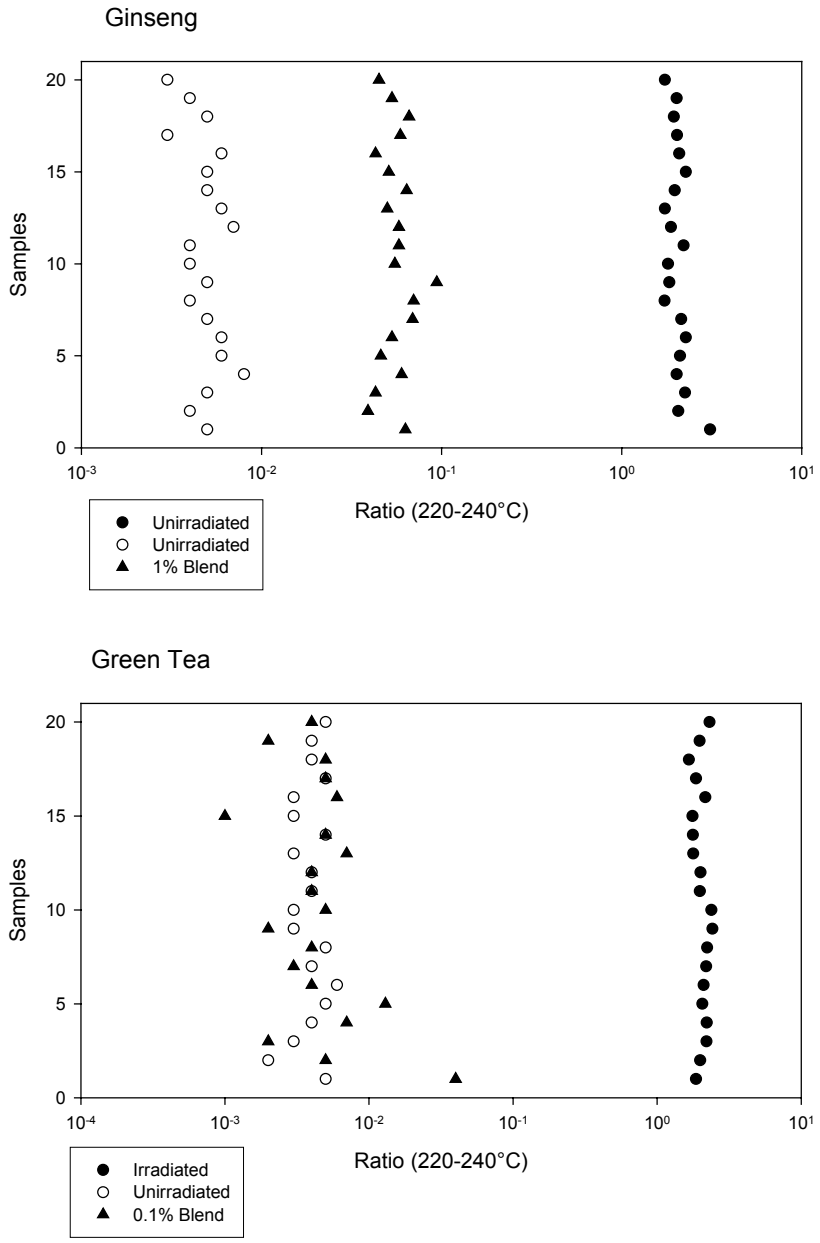


Figure 5.7 TL homogeneity testing glow ratio plot for SP8577 and SP8578

5.3 Participants' Results

5.3.1 Quantitative results

TL results were returned by 16 of the 18 laboratories which received samples. TL participants were asked to return LiF temperature control data, first and second glow data, glow ratio, comments on glow curve shape and classification.

Table 5.1 presents participants' LiF data as a mean for peak V for each laboratory, and the minimum detectable level (MDL). All raw data appear in Appendix C. The units for MDL depend upon the equipment, which is also tabulated. The value for lab 5 LiF appears to be an error; it is suspected that the wrong peak was identified since this magnitude of temperature discrepancy could not have allowed them to perform as well as they have. The range of peak V estimates from the other laboratories varies from 220-293 °C, which although a slight reduction from that encountered in some of the early trials in the 1990's still represents a very significant variation from laboratory to laboratory. This is of potential concern when dealing with blends classified by the presence or absence of peaks in the EN1788 temperature band of 150-250°C.

Labs	TL Reader	Mean Peak V	MDL
1	TLD 3500	234	0,37 nC
2	Harshaw TLD 4000	275	7.5nC
3	TLD 3500	234	3,12nC
4	Harshaw TLD-Reader 3500	245	20 nC
5	Harshaw 3500	90.5	0.047nC
6	HARSHAW TLD 3500	235	0,098 nC
7	Harshaw M3500	255	0.13nC
8	Risö TL/OSL-DA15	254	502
10	Harshaw 3500	246	0.54
11	TL-DA-15; RISO	257	358.49
13	Risoe TL-DA-15 Series No 194-05/2005-b	263	2492
14	Harshaw 3500	220	0.354nC
15	TL-DA-10	293	636
18	Harshow TL 3500	232	2.56nC
24	Harshaw TLD 3500	228	1.9nC

Table 5.1 LiF peak V temperatures and MDL for all laboratories

Figures 5.8-5.10 present glow ratios for each laboratory and each product, with the 3 irradiation categories given different symbols. Intensities could not be plotted analogously to Figures 5.2-4 because participants used a variety of units for their measurements.

Figures 5.11-5.13 display *z* scores by laboratory; figures 5.14-16 display them by sample. The data are tabulated in Table 5.2. Contour plots have also been produced (Figures 5.17-19).

From the figures it can be seen that participants' data distinguish the irradiated samples but are markedly less well separated by glow ratio than the homogeneity testing data for the 10% and 1% blends. For the 0.1% blends where the unirradiated and blended results overlap in the homogeneity testing, the same is true for the participants but with more scatter. Some of the scatter may be explained by the use of different instruments with several different types of equipment with different irradiation sources, but there is also likely to be a component

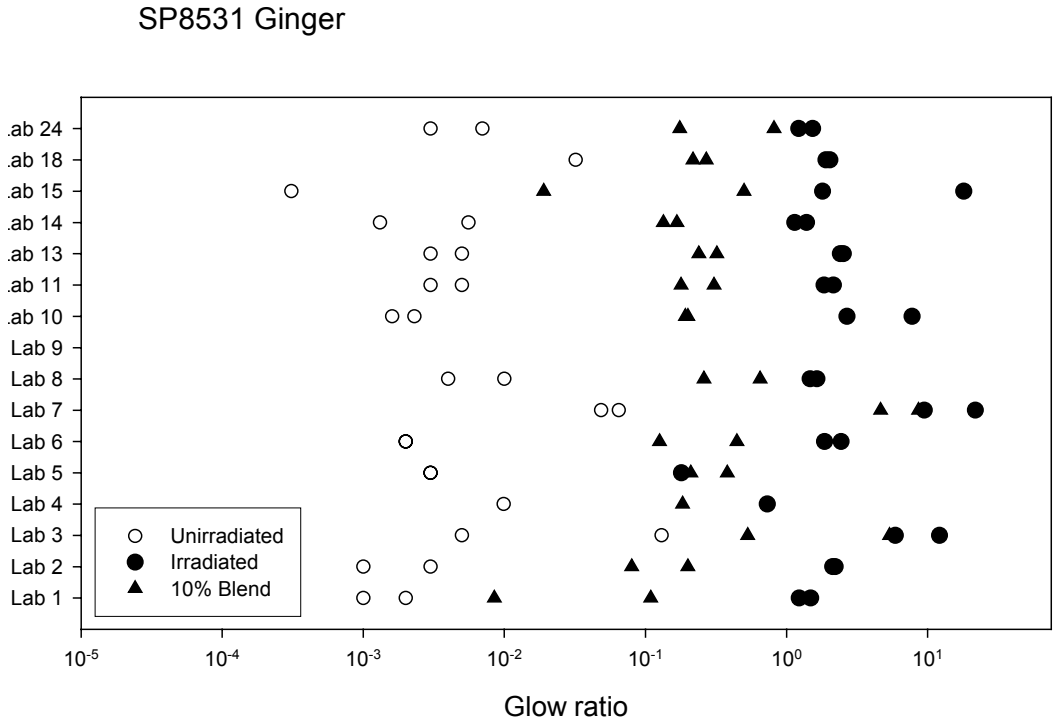
associated with efficiency of mineral separation. In some instances the samples could have been mislabelled leading to a lower glow ratio for the irradiated material than for either the unirradiated or the blend. This is also apparent in the *z*-score plots which have corresponding outliers. Even without these outliers, the *z*-scores show a wider distribution than the equivalent for PSL. This is not unexpected since the distribution of a ratio is likely to follow a Cauchy distribution rather than a Gaussian, and thus to have broader tails.

Figures 5.11-13 show clearly that some laboratories have more closely spaced *z*-scores than others; for unirradiated samples labs 1, 13 and 18 had the smallest spread. These 3 laboratories also performed well with irradiated samples, if an outlier for lab 1 is discounted, but labs 6, 8, 11, and 14 also did well. With the blends, only lab 18 has a tight dispersion of *z*-score.

Plots of *z*-score by sample show that samples 6 and 9 (unirradiated and irradiated Rosemary), 10, 11 and 12 (all 3 Tarragon samples) and 7 (0.1% Chilli blend) produced tighter groupings. This suggests that higher mineral yields from some products may affect results. There is no overall correlation between blend concentration and spread of *z*-score.

The contour plots reveal that SP8533 Rosemary consistently produces *z*-scores which differ from zero, despite the tighter grouping. These plots also show that labs 2, 3 and 4 have higher scores for unirradiated materials; higher scores for irradiated materials are seen for labs 3, 5, and 7 with slightly elevated scores for lab 11 but lower scores for lab 14, and labs 2 and 4 also have higher scores for the blends, which are otherwise more varied.

Given the limit amount of sample available (some participants were unable to obtain sufficient minerals from some sample to be able to return a result) the overall performance is quite good, although there are some issues still to be addressed.



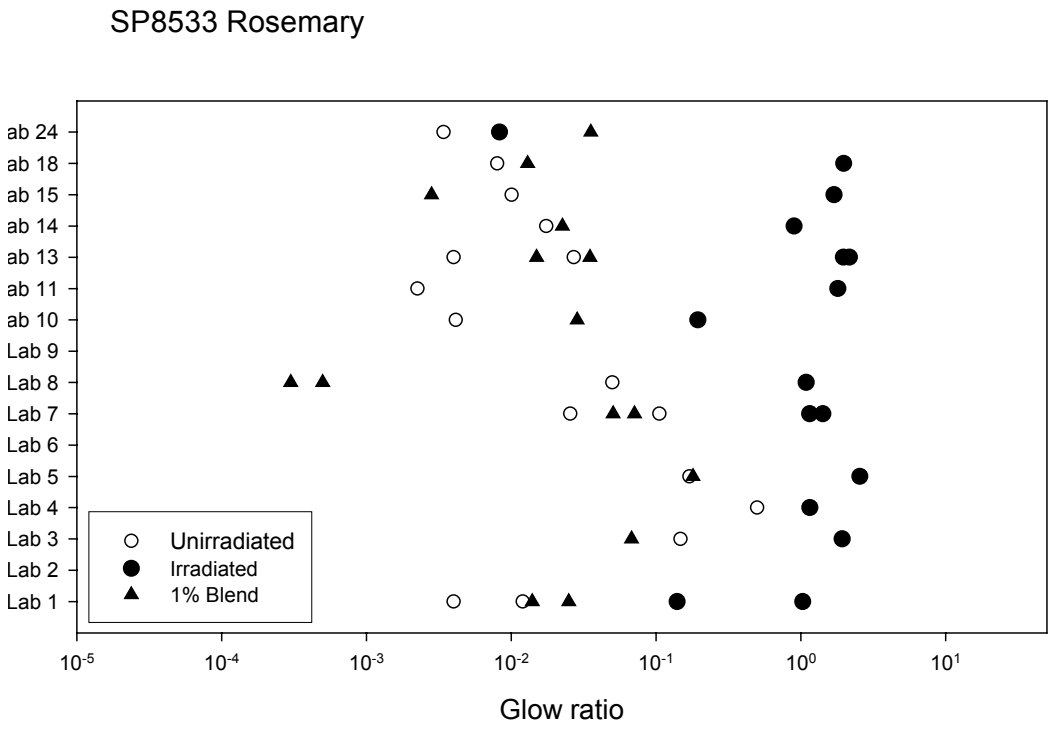


Figure 5.8 Participants' glow ratios for SP8531 and SP8533

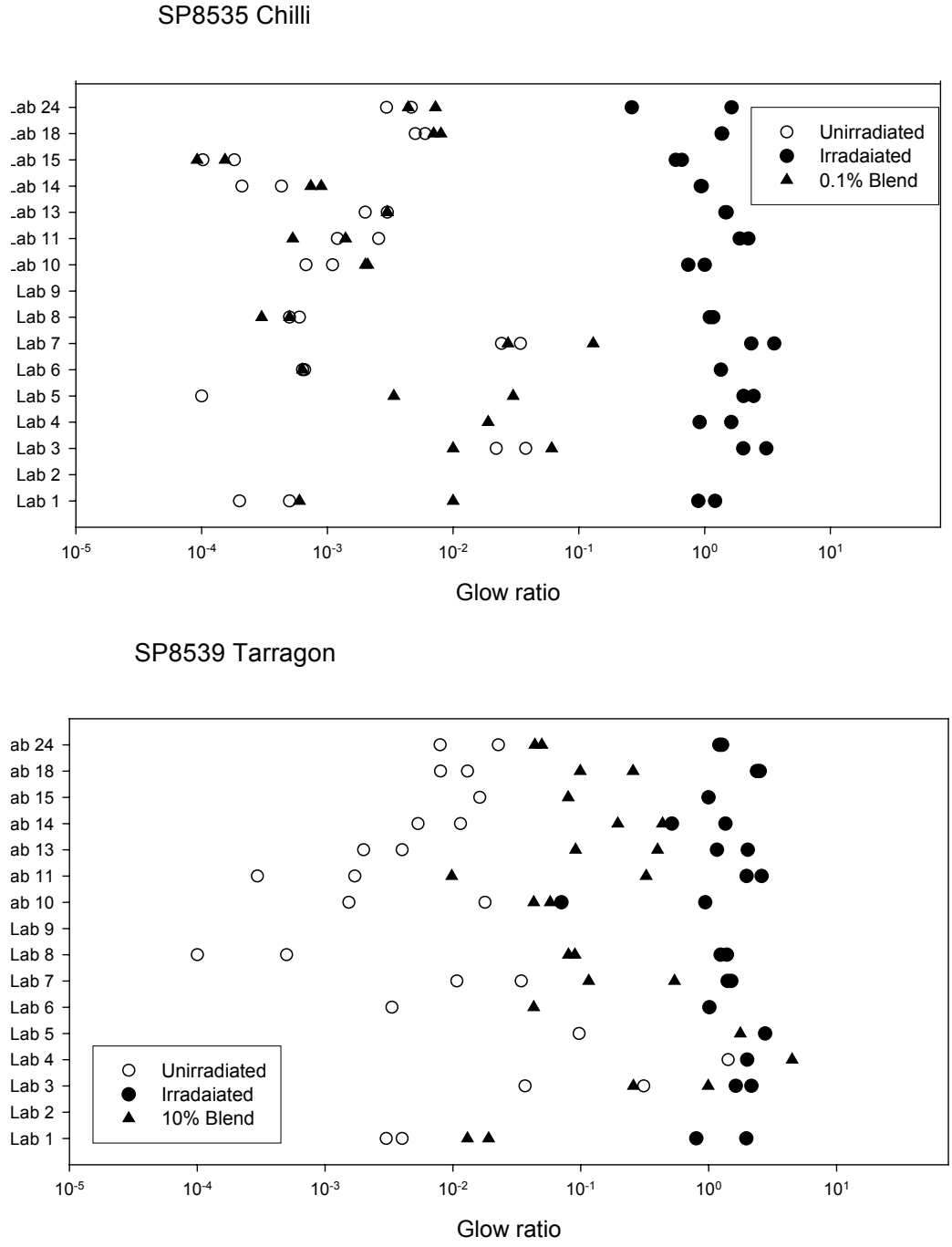
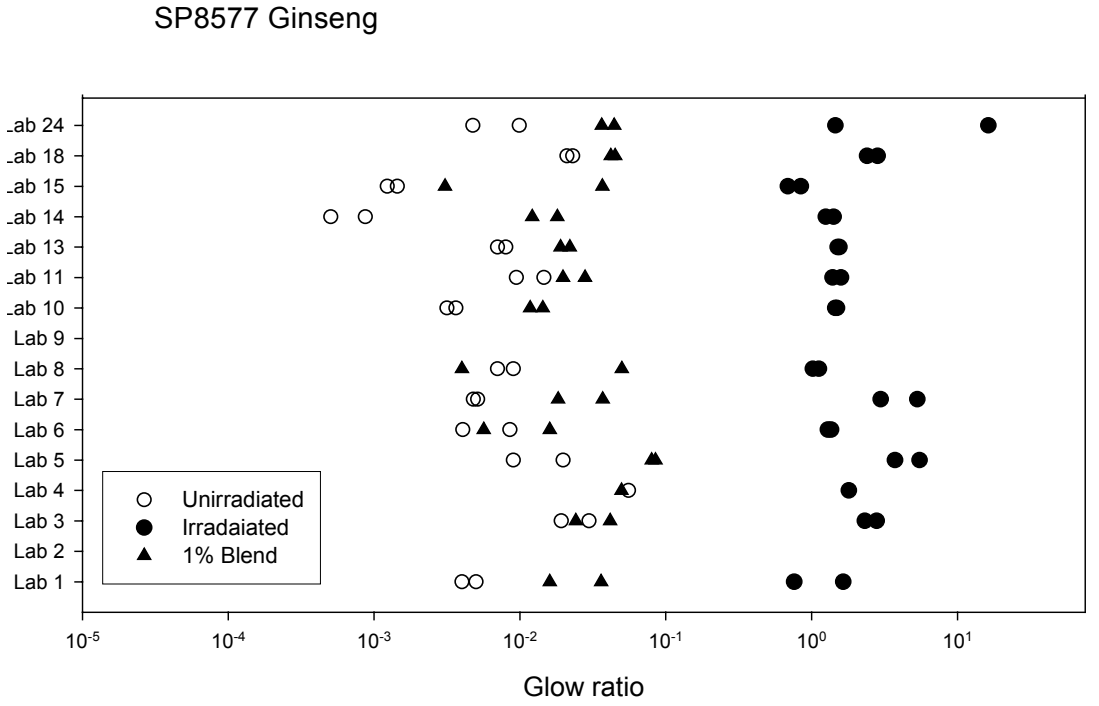


Figure 5.9 Participants' glow ratios for SP8535 and SP8539



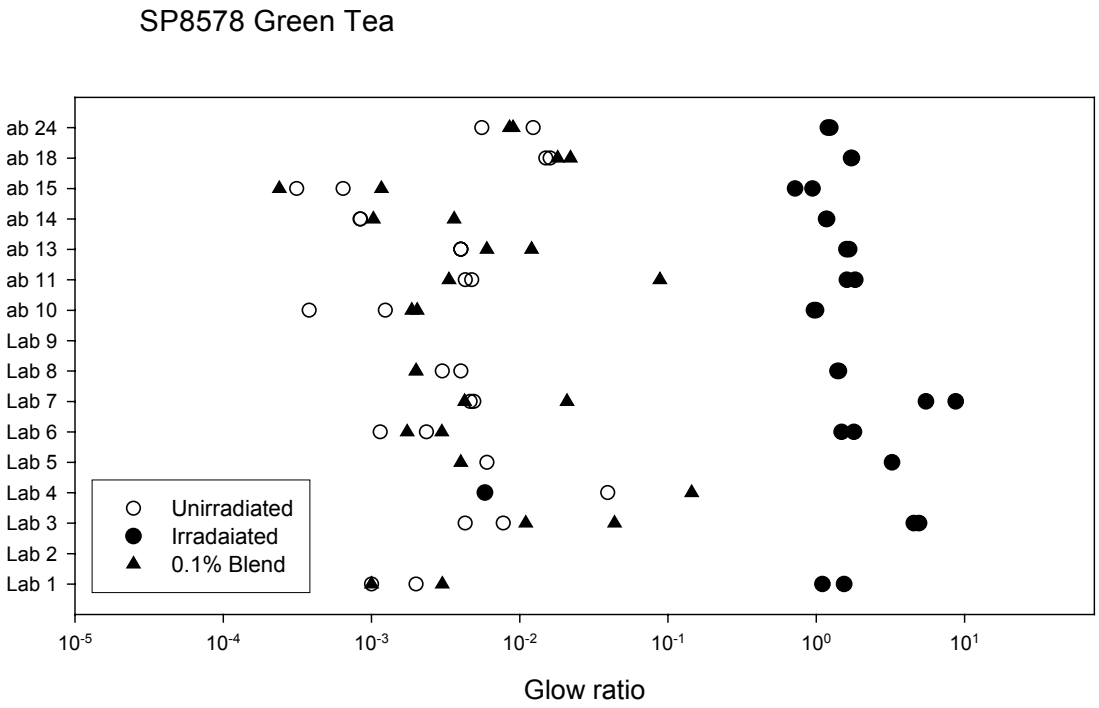


Figure 5.10 Participants' glow ratios for SP8577 and SP8578

Unirradiated

	Sample 1 Ginger		Sample 6 Rosemary		Sample 8 Chilli		Sample10 Tarragon		Sample15 Ginseng		Sample17 Green Tea	
Lab 1	-2.61	-1.19	1.03	1.92	-3.49	-1.85	0.09	-0.12	0.12	-0.76	-4.95	-2.41
Lab 2	-0.36	-2.61	5.51	5.51	11.81	11.81	4.19	4.19	21.03	21.03	20.34	20.34
Lab 3	0.69	7.37	3.96	5.51	4.96	5.93	3.32	1.73	5.43	7.15	2.54	0.37
Lab 4	2.09	11.56	4.95	5.51	11.81	11.81	4.45	4.19	9.61	21.03	8.48	20.34
Lab 5	-0.36	-0.36	4.07	5.51	-4.74	11.81	2.46	4.19	2.44	5.53	1.61	20.34
Lab 6	-1.19	-1.19	5.51	5.51	-1.35	-1.42	-0.05	4.19	-0.71	2.23	-4.45	-1.83
Lab 7	5.94	5.35	2.53	3.68	5.75	5.13	1.68	0.82	0.21	-0.06	0.86	0.66
Lab 8	0.23	2.11	3.08	5.51	-1.52	-1.85	-2.65	-1.45	2.44	1.45	0.12	-0.93
Lab 10	-0.90	-1.65	1.05	5.51	-0.43	-1.31	1.20	-0.62	-1.14	-1.70	-8.49	-4.17
Lab 11	-0.36	0.69	0.56	5.51	1.09	-0.28	-1.85	-0.54	2.63	4.35	0.38	0.74
Lab 13	-0.36	0.69	2.58	1.03	0.64	1.37	-0.42	0.09	1.97	1.45	0.12	0.12
Lab 14	-2.05	0.91	2.22	5.51	-2.11	-3.41	0.87	0.30	-6.77	-8.94	-5.60	-5.58
Lab 15	-5.01	11.56	1.78	5.51	-4.70	-3.66	1.13	4.19	-5.41	-4.79	-6.57	-9.21
Lab 18	4.50	5.01	1.59	1.59	2.62	2.29	0.97	0.60	6.14	5.78	5.20	4.96
Lab 24	1.38	-0.36	0.90	5.51	2.16	1.34	1.38	0.60	2.81	-0.08	1.32	4.24

Table 5.2 *z*-score for TL analyses – unirradiated samples. Laboratory numbers are those allocated for TL apart from 18 and 24 which are PSL identifiers (these labs joined later)

Irradiated

	Sample2 Ginger		Sample 4 Rosemary		Sample 9 Chilli		Sample11 Tarragon		Sample13 Ginseng		Sample18 Green Tea	
Lab 1	-4.29	-3.44	-5.41	-22.02	-2.11	-4.16	-0.64	-4.67	-1.62	-7.50	-2.58	-5.71
Lab 2	-1.59	-1.78	-5.66	-5.66	-3.39	-3.39	-3.67	-3.67	-5.42	-5.42	-6.60	-6.60
Lab 3	6.27	2.94	-0.20	-5.66	1.34	4.15	-1.48	-0.23	0.95	2.36	7.47	8.24
Lab 4	-6.70	-5.24	-4.47	-5.66	-0.13	-3.99	-0.58	-3.67	-0.97	-5.42	-54.43	-6.60
Lab 5	-13.15	-5.24	2.17	-5.66	1.38	2.59	0.88	-3.67	4.56	7.50	4.33	-6.60
Lab 6	-2.38	-1.14	-5.66	-5.66	-1.40	-3.39	-3.61	-3.67	-3.46	-3.10	-2.94	-1.16
Lab 7	8.95	5.12	-2.73	-4.48	5.14	2.33	-1.86	-2.15	7.23	2.85	13.53	9.22
Lab 8	-3.47	-2.96	-4.94	-5.66	-2.75	-2.34	-2.20	-2.71	-4.56	-5.27	-3.53	-3.34
Lab 10	4.19	-0.71	-19.29	-5.66	-3.38	-5.39	-3.94	-15.51	-2.39	-2.60	-6.93	-6.64
Lab 11	-2.42	-1.73	-0.75	-5.66	1.98	0.90	0.59	-0.62	-1.90	-2.91	-0.96	-2.18
Lab 13	-0.98	-1.20	0.77	-0.01	-0.83	-0.70	-3.00	-0.54	-2.09	-2.31	-1.86	-2.25
Lab 14	-3.74	-4.63	-6.55	-5.66	-3.75	-3.86	-2.31	-6.63	-2.78	-3.71	-5.03	-5.17
Lab 15	8.08	-2.54	-1.25	-5.66	-6.92	-6.19	-3.68	-3.67	-6.70	-8.25	-7.13	-9.67
Lab 18	-1.98	-2.29	0.01	0.42	-1.31	-1.25	0.43	0.21	2.48	1.22	-1.46	-1.57
Lab 24	-3.28	-4.34	-45.52	-5.66	-0.08	-12.29	-2.59	-2.81	15.73	-2.58	-4.93	-4.58

Table 5.3 *z*-score for TL analyses – irradiated samples. Laboratory numbers are those allocated for TL apart from 18 and 24 which are PSL identifiers (these labs joined later)

Blends

	Sample 3 Ginger		Sample 5 Rosemary		Sample 7 Chilli		Sample12 Tarragon		Sample14 Ginseng		Sample16 Green Tea	
Lab 1	-1.48	-5.32	-0.56	0.19	0.61	-1.04	-1.92	-2.24	-2.11	-6.03	-1.99	-0.54
Lab 2	-0.57	-1.95	5.01	5.01	3.30	3.30	1.44	1.44	13.94	13.94	7.13	7.13
Lab 3	4.38	0.90	1.50	5.01	1.66	0.61	1.43	0.29	-1.42	-4.03	3.00	1.18
Lab 4	-0.70	1.85	5.01	5.01	0.98	3.30	2.72	1.44	-0.56	13.94	4.58	7.13
Lab 5	-0.49	0.40	2.77	5.01	-0.03	1.25	1.93	1.44	1.74	2.04	-0.16	7.13
Lab 6	0.64	-1.26	5.01	5.01	-1.00	3.30	-1.23	1.44	-6.03	-11.06	-0.54	-1.26
Lab 7	4.16	5.09	1.11	1.56	2.11	1.20	0.92	-0.39	-5.39	-1.99	2.02	-0.08
Lab 8	-0.17	1.21	-4.91	-5.58	-1.14	-1.44	-0.70	-0.60	-0.53	-12.72	-1.07	-1.07
Lab 10	-0.57	-0.63	0.37	5.01	-0.33	-0.31	-1.23	-0.98	-7.53	-6.56	-1.16	-1.05
Lab 11	-0.73	0.07	5.01	5.01	-1.11	-0.54	0.49	-2.48	-3.34	-5.01	3.93	-0.40
Lab 13	-0.30	0.14	0.63	-0.47	-0.10	-0.10	0.66	-0.59	-4.49	-5.20	0.38	1.29
Lab 14	-1.17	-0.84	0.06	5.01	-0.80	-0.92	0.05	0.74	-7.36	-5.44	-1.95	-0.29
Lab 15	0.81	-4.11	-2.65	5.01	-1.83	-2.13	-0.70	1.44	-2.02	-14.01	-1.78	-3.88
Lab 18	-0.12	-0.44	-0.66	-0.31	0.48	0.40	0.29	-0.52	-1.37	-1.04	2.09	1.83
Lab 24	-0.77	1.55	0.65	5.01	0.42	0.13	-1.11	-1.21	-2.06	-1.11	0.85	0.92

Table 5.4 *z*-score for TL analyses – blended samples. Laboratory numbers are those allocated for TL apart from 18 and 24 which are PSL identifiers (these labs joined later)

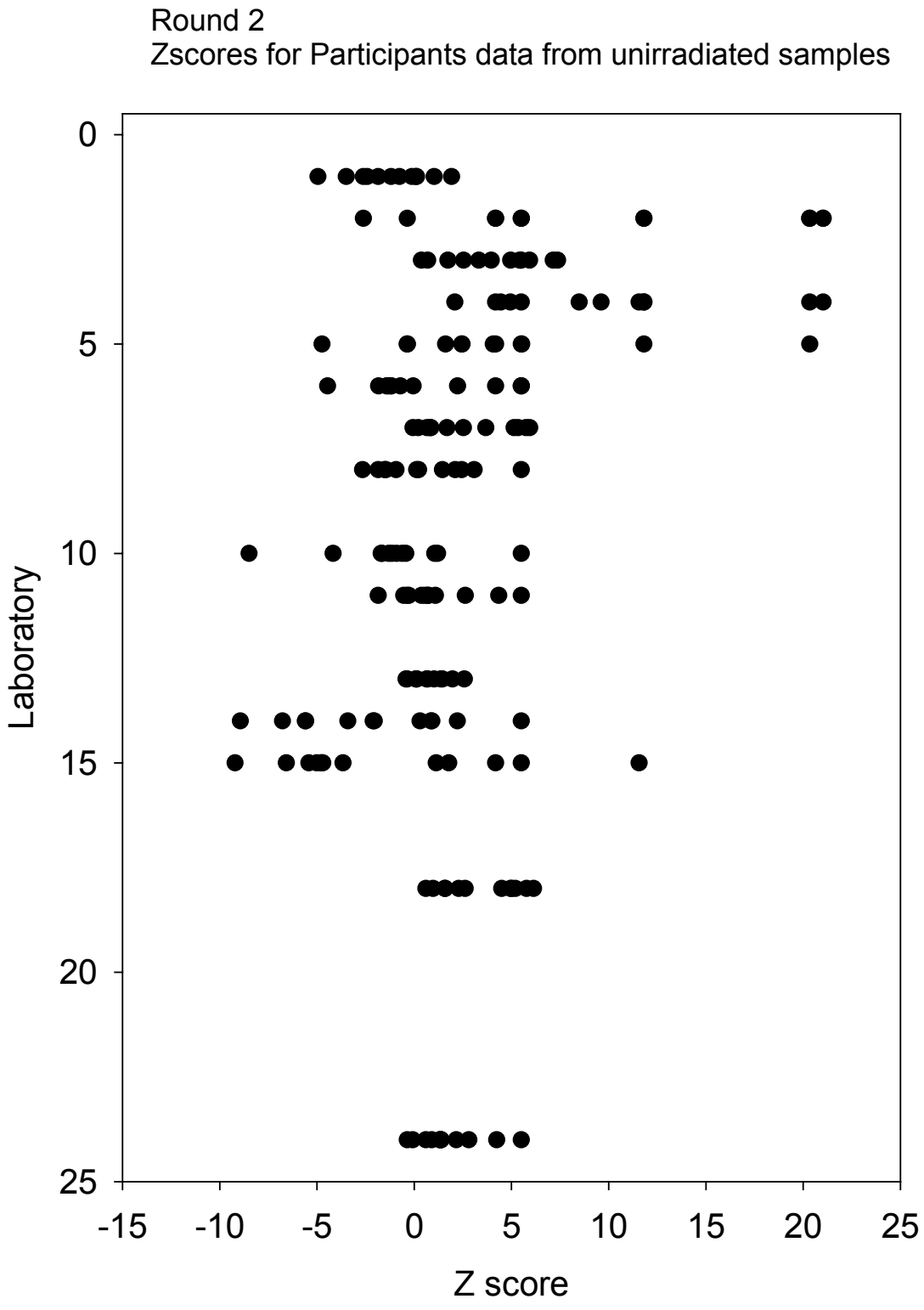


Figure 5.11 Participants' TL *z*-scores for unirradiated samples by laboratory

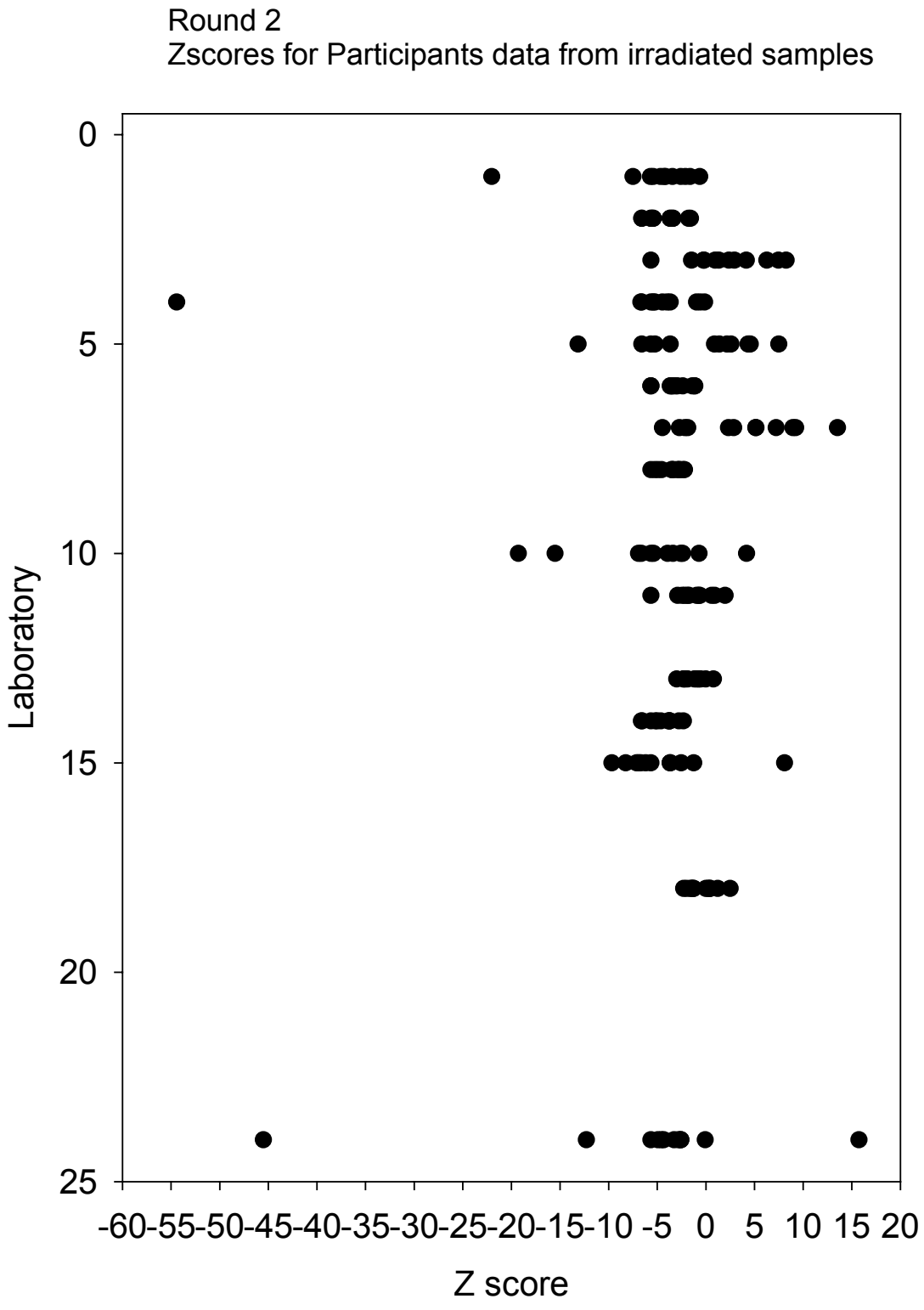


Figure 5.12 Participants' TL *z*-scores for irradiated samples by laboratory

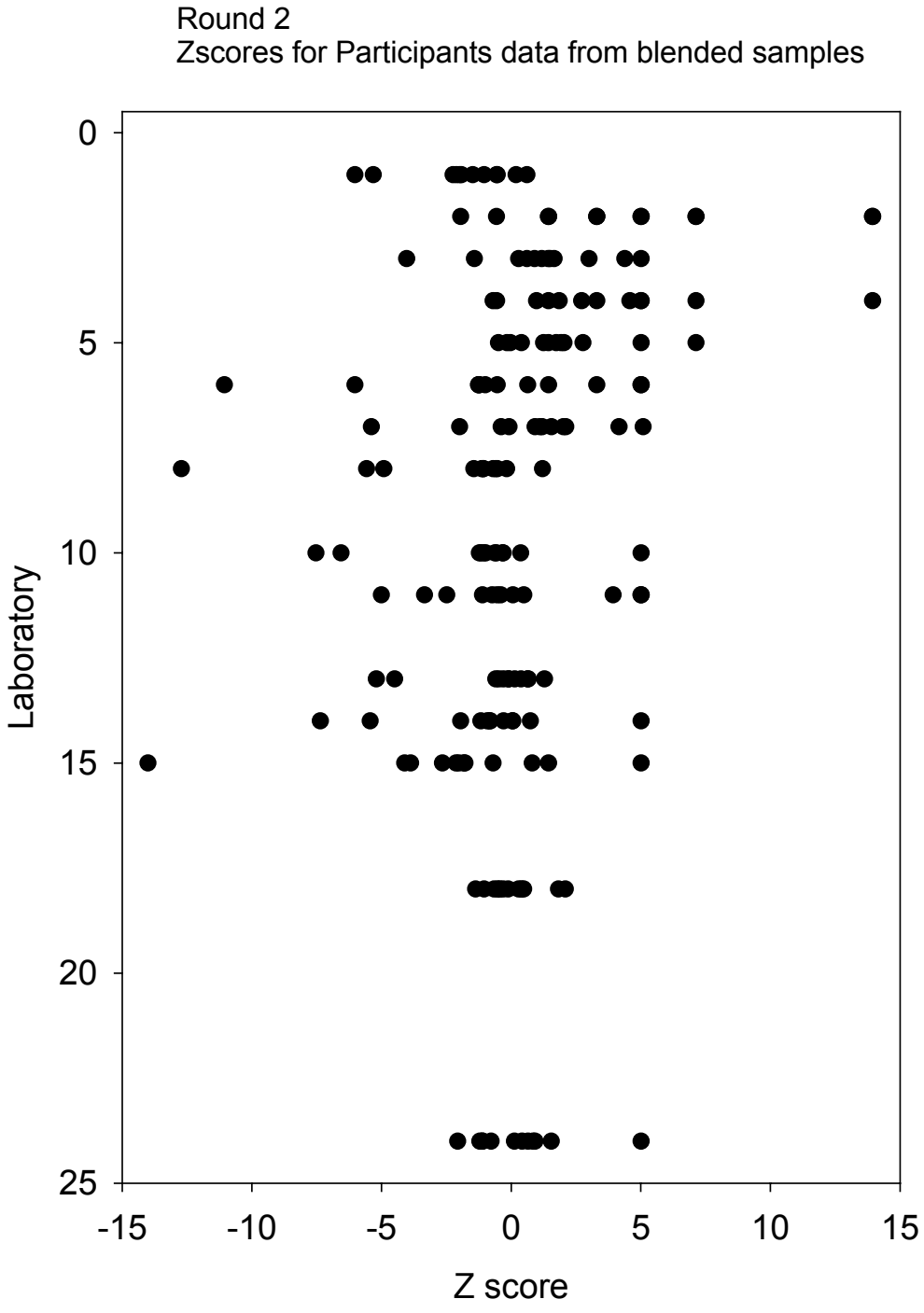


Figure 5.13 Participants' TL *z*-scores for blended samples by laboratory

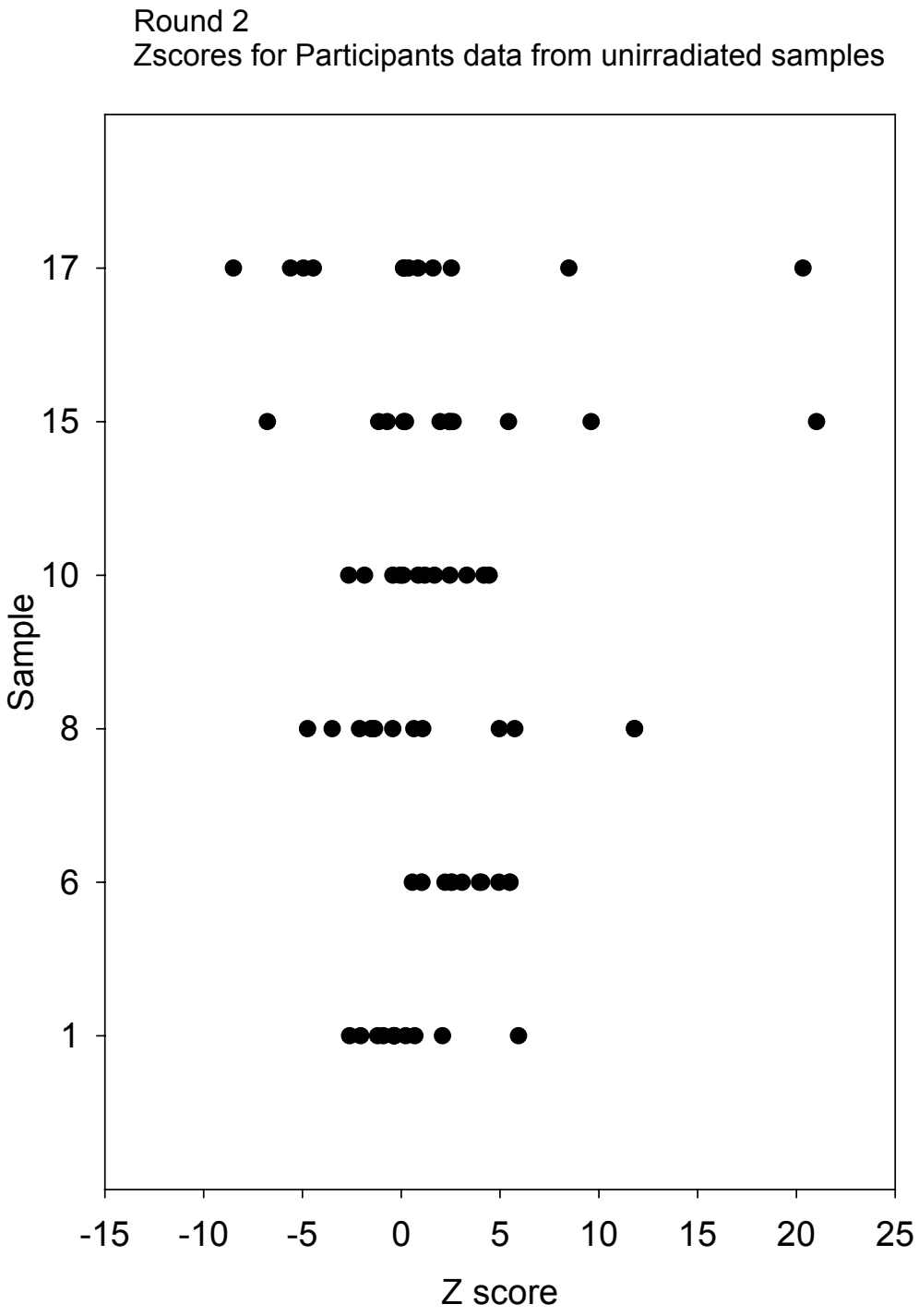


Figure 5.14 Participants' TL *z*-scores for unirradiated samples by sample Sample 1 = Ginger, sample 6 = Rosemary, sample 8 = Chilli, sample 10= Tarragon, sample 15 = Ginseng, sample 17 = Green tea

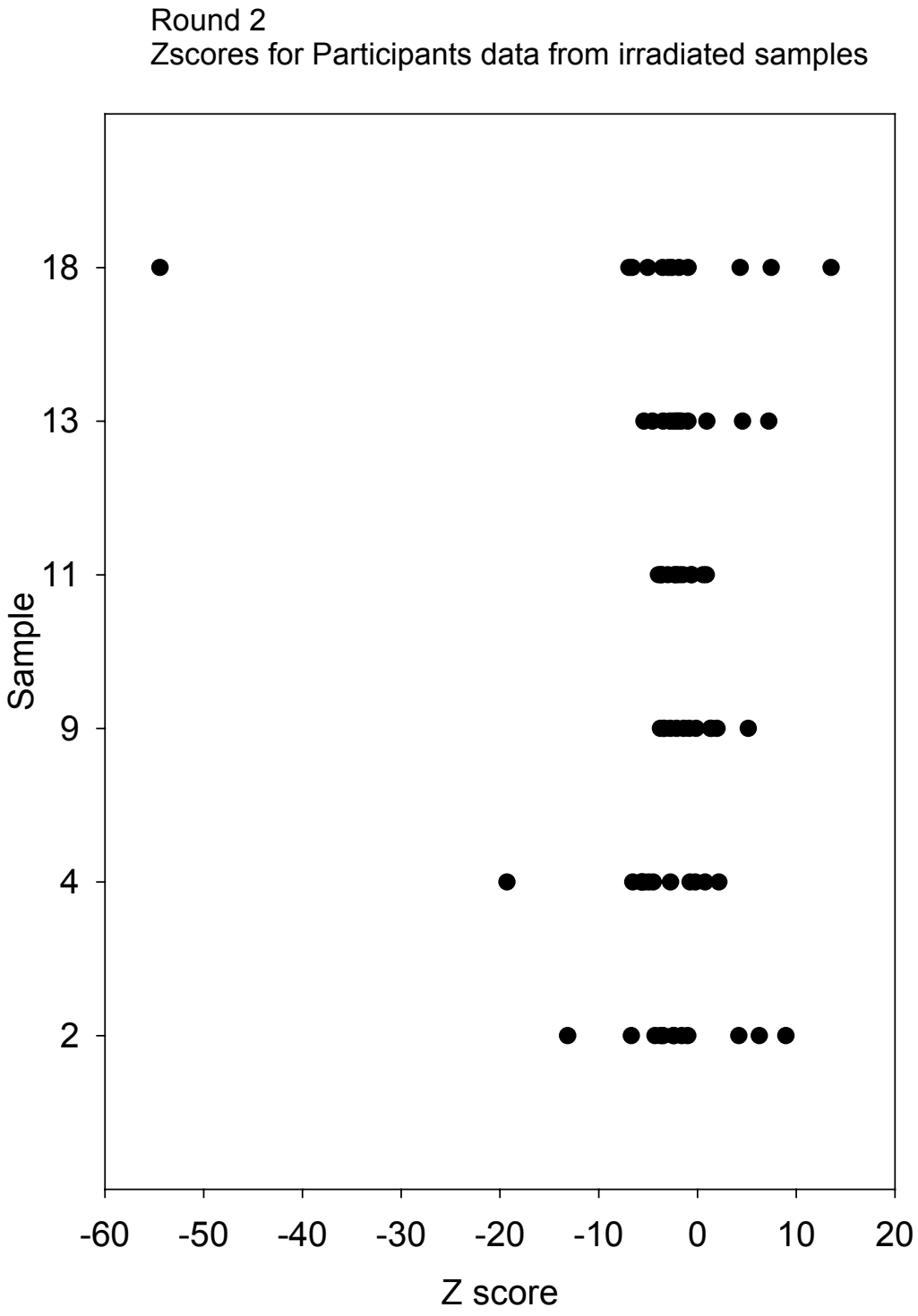


Figure 5.15 Participants' TL *z*-scores for irradiated samples by sample
Sample 2 = Ginger, sample 4 = Rosemary, sample 9 = Chilli, sample 11= Tarragon, sample 13 = Ginseng, sample 18 = Green tea

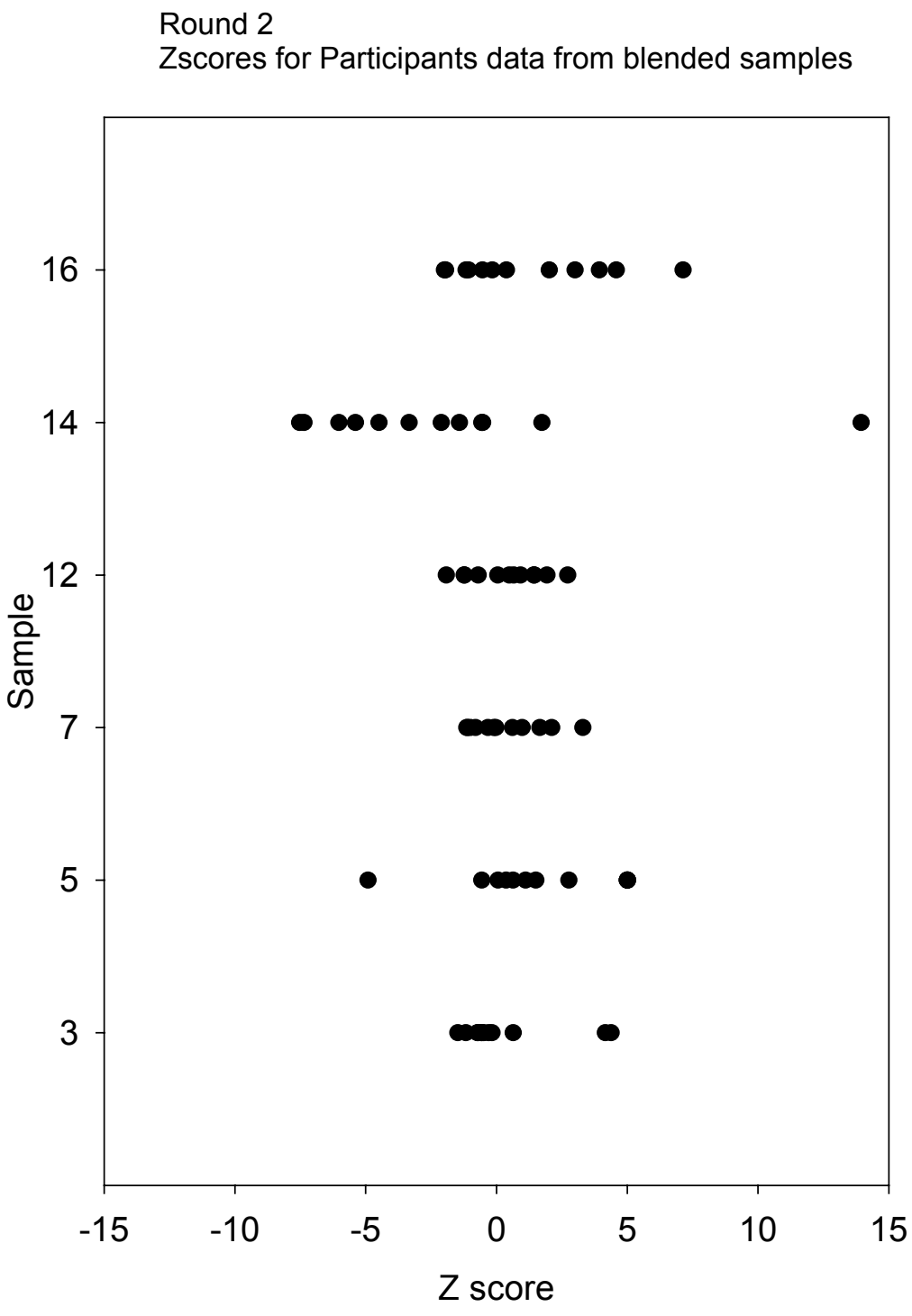


Figure 5.16 Participants' TL *z*-scores for blended samples by sample
Sample 3 = Ginger, sample 5 = Rosemary, sample 7 = Chilli, sample 12= Tarragon, sample 14 = Ginseng, sample 16 = Green tea

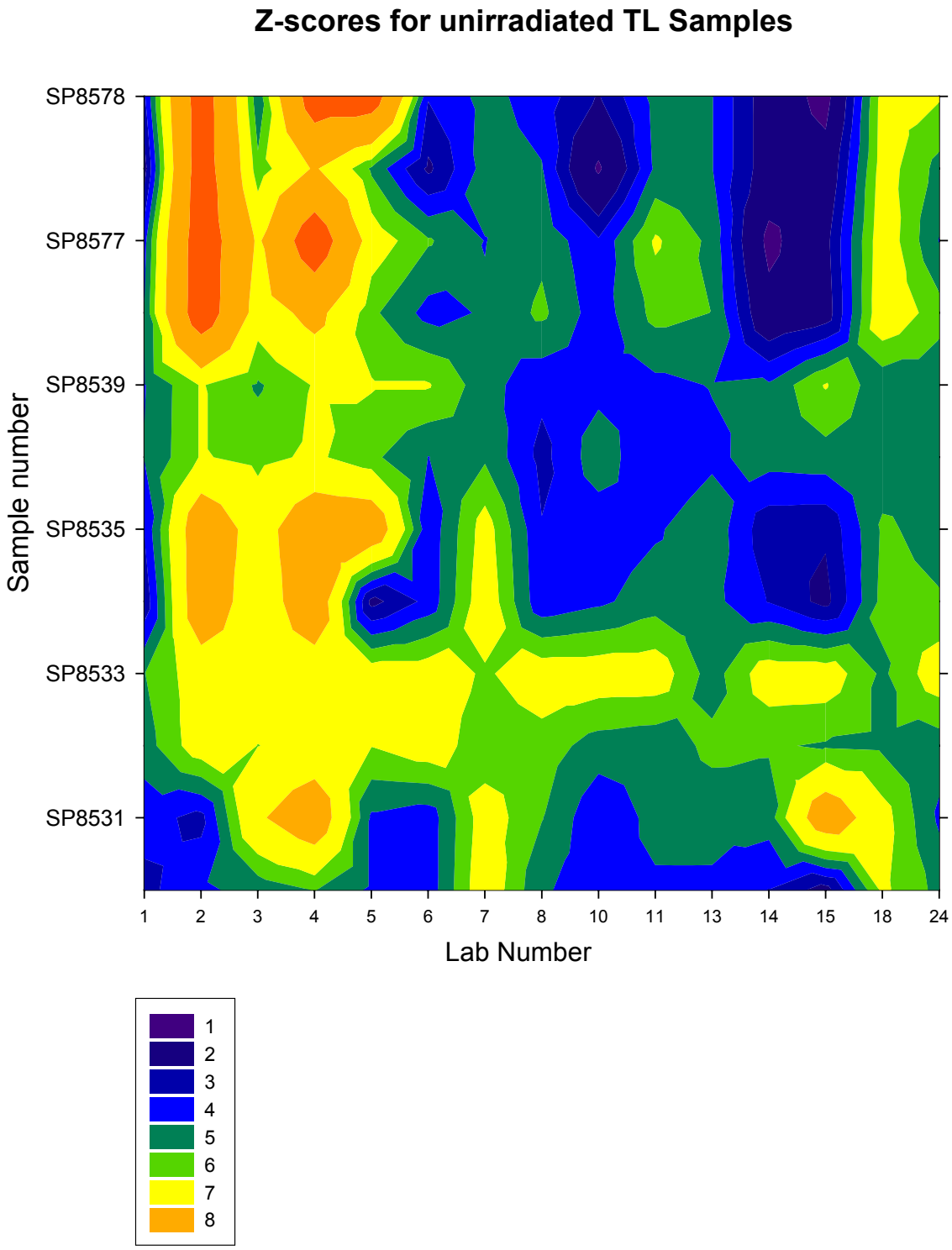


Figure 5.17 Contour plot for participants' TL data for unirradiated samples

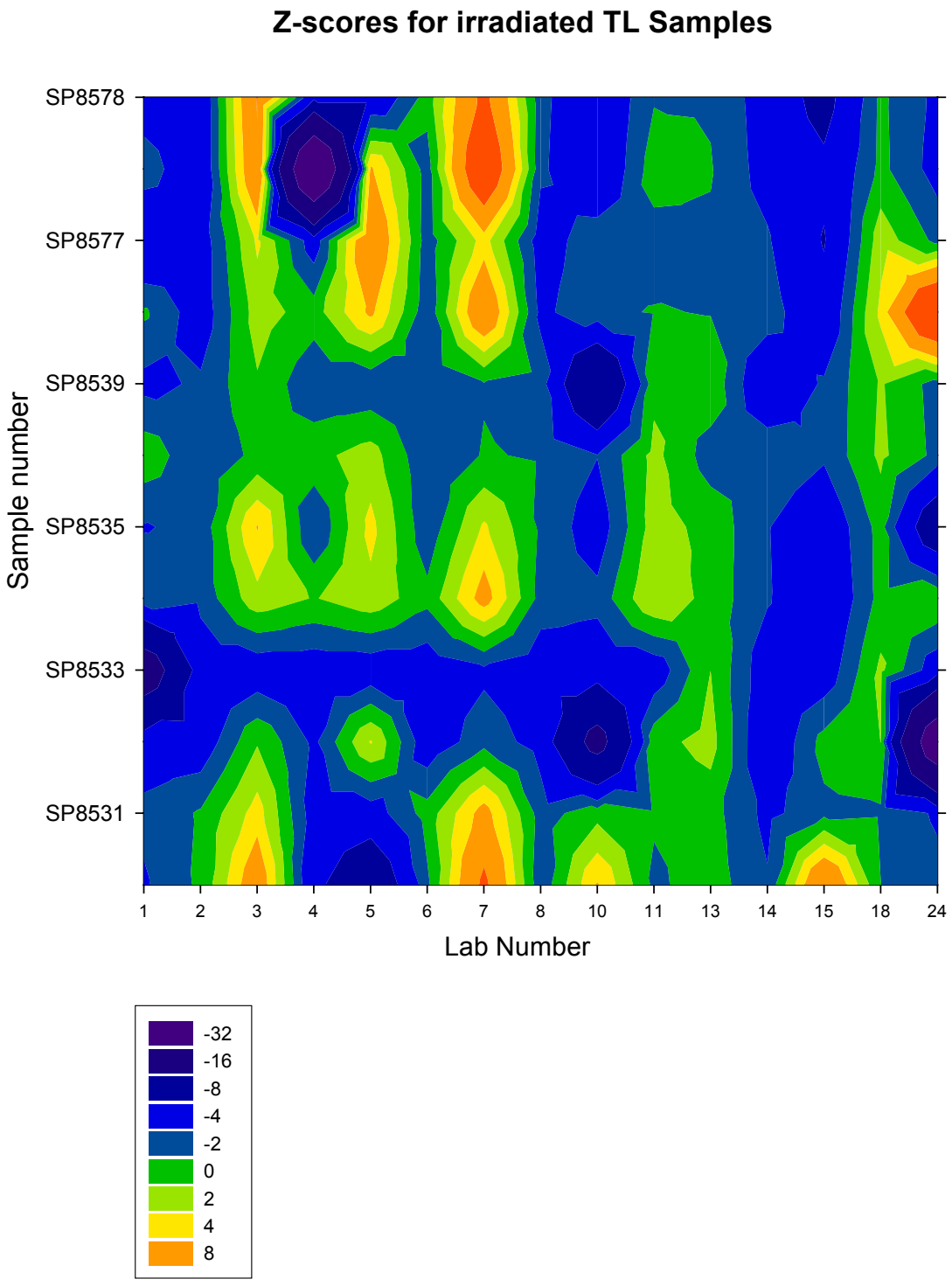


Figure 5.18 Contour plot for participants' TL data for irradiated samples

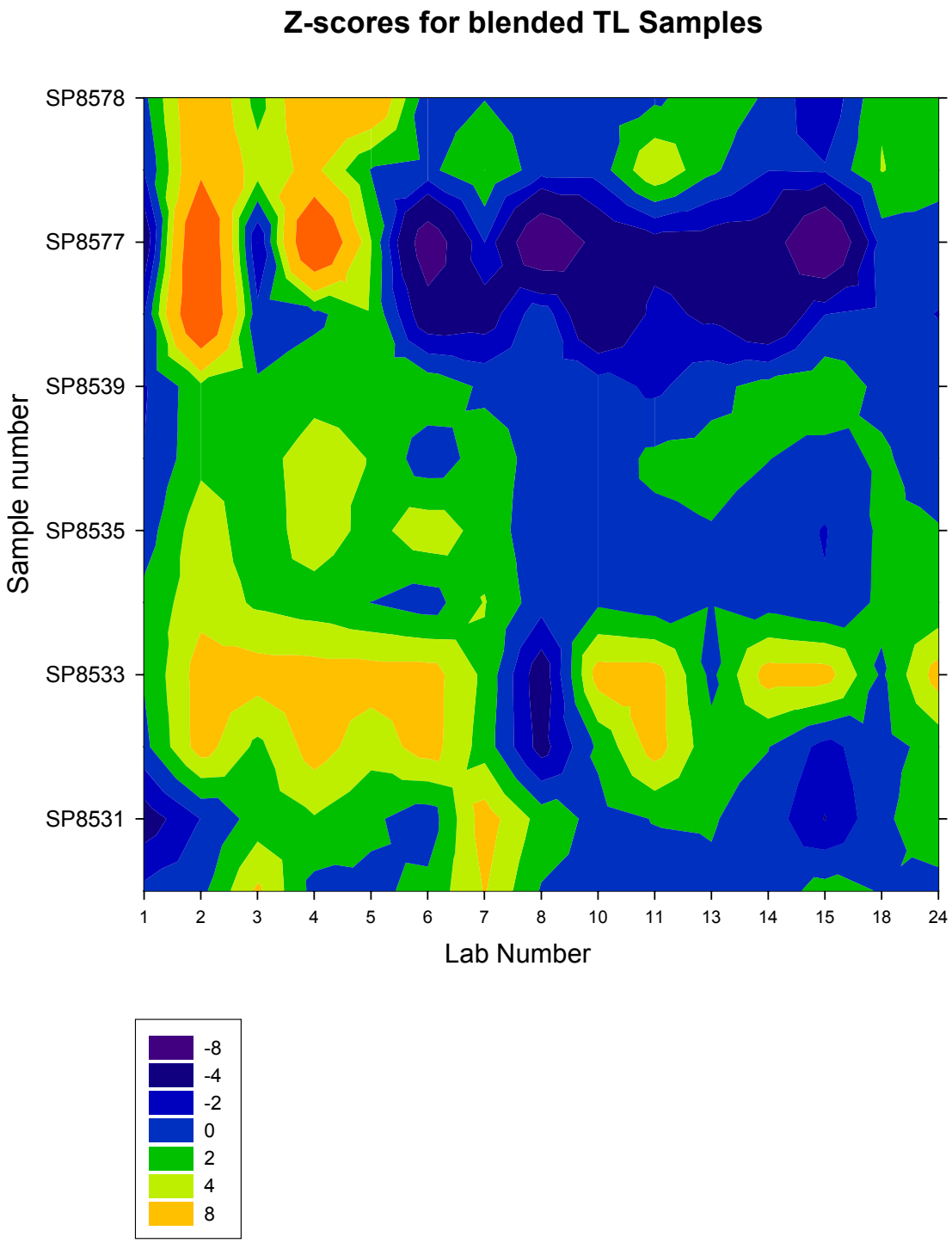


Figure 5.19 Contour plot for participants' TL data for blended samples

5.3.2 Qualitative results

Participants were asked to return classifications of the samples as well as descriptions of the glow curves. These can both be used to assess whether they corrected identified the irradiation status of the materials. Table 5.5 details their classifications compared with the known status of the material, both by laboratory and by product.

Lab	Unirradiated			Irradiated			Blends		
	Correct	Incorrect	Other	Correct	Incorrect	Other	Correct	Incorrect	Other
1	6	0	0	6	0	0	3	3	0
2	1	0	5	1	0	5	1	0	5
3	6	0	0	6	0	0	3	3	0
4	3	3	0	6	0	0	2	3	1
5	4	1	1	6	0	0	4	2	0
6	5	0	1	6	0	0	2	2	2
7	6	0	0	6	0	0	2	2	2
8	6	0	0	6	0	0	3	3	0
10	6	0	0	6	0	0	5	0	1
11	6	0	0	5	1	0	5	1	0
13	6	0	0	6	0	0	3	3	0
14	4	2	0	6	0	0	5	1	0
15	4	0	2	4	0	2	2	2	2
18	6	0	0	6	0	0	6	0	0
24	6	0	0	6	0	0	2	4	0
Total	75	6	9	82	1	7	48	29	13
Percentage	83.33%	6.67%	10%	91.11%	1.11%	7.78%	53.34%	32.22%	14.44%
Percentage of results returned	92.59%	7.40%		98.80%	1.20%		62.34%	37.66%	

Product	Unirradiated			Irradiated			Blends		
	Correct	Incorrect	Other	Correct	Incorrect	Other	Correct	Incorrect	Other
SP8531	14	1	0	14	1	0	15	0	0
SP8533	10	1	4	13	0	2	3	8	4
SP8535	14	0	1	14	0	1	5	7	3
SP8539	11	2	2	13	0	2	12	0	3
SP8577	13	1	1	14	0	1	9	4	2
SP8578	13	1	1	14	0	1	4	10	1
Total	75	6	9	82	1	7	48	29	13
Percentage	83.33%	6.67%	10%	91.11%	1.11%	7.78%	53.34%	32.22%	14.44%
Percentage of results returned	92.59%	7.40%		98.80%	1.20%		62.34%	37.66%	

Other : Participants have either stated that they were unable to obtain sufficient minerals, presented G2 results less than 10 x MDL or supplied no data for that sample.

Table 5.5 Qualitative results from TL participants

Overall performance for unirradiated and irradiated materials is good, with correct identification in 83% and 91% of cases respectively. If those cases where participants were unable to recover sufficient minerals are excluded the correct identification rate rises to 93% and 99% respectively. The incorrect results from unirradiated samples were obtained in laboratories 4 (3 cases), 14 (2 cases) and 5 (1 case), and for the irradiated samples laboratory 11 (1 case). It was noted from reference analyses that small low temperatrure peaks were observed in the tarragon sample in 11 out of 20 aliquots prepared. This may account for two of the "incorrect" classifications from unirradiated samples in participants' data, however the other 4 are not represented in reference data, and are thus unexplained.

The success rate for blends is lower, as to be expected both from the nature of the materials and from the quantitative data described above. From table 5.5 it is apparent that the 10% blends are clearly easier to identify, with all reported analyses giving correct outcomes, and 3 cases where insufficient mineral yields were encountered. At the lower concentrations detection rates are poorer, and the concentration dependence is less apparent.

The TL results from this round of the proficiency testing study have confirmed that participants are capable of exceeding the IUPAC criteria for collaborative trials (of 80% success rates from a quorum of at least 5-10 laboratories studying a minimum of 5 blind samples). The performance overall therefore can be considered to affirm the validity of the EN1788 standard, with a new generation of laboratory practitioners in comparison with the original blind studies of the 1990's. That itself is a useful result at this stage, albeit incidental to the aims of the PT development. However the observations of 7-15% failures to recover sufficient minerals from the samples, which had all produced adequate recoveries in reference analyses, and a small proportion (7%) of incorrect classifications from unirradiated materials does suggest varying levels of proficiency in different laboratories. For blended mixtures the results at 10% concentration were very satisfactory. However at both lower concentration levels detection rates were reduced. Reference analyses suggested that the performance at 1% concentration might have been better, although at 0.1% concentration a spread of outcomes was expected. At this stage it is unclear whether individual laboratory performance differences drive the outcomes for dilute blends, or whether the results are mainly reflecting the statistical fluctuations in mineral yields and brightnesses, although these features may be identifiable in future work of this sort.

6. DISCUSSION AND CONCLUSIONS

As shown in the previous sections the second round of the trial was successfully implemented, with test material distribution, additional homogeneity testing and the second measurement round taking place within a few months.

The calibrated PSL reference data sets obtained in the organising laboratory resemble earlier published data from the original PSL research and inter-laboratory trial data sets, as does TL homogeneity testing.

PSL screening results from 30 participating laboratories were returned in a timely manner and generally show equivalence to the SUERC reference data. For some participants the round 1 difficulties with cross contamination have been overcome or reduced; for others there are still problems. The participants that still experienced these difficulties tended to have greater proportions of unirradiated test materials in higher qualitative classification categories than the reference data set or data from the other participants. The 3 new laboratories who had not taken part in round 1 all performed well.

The data sets have been explored using descriptive statistics and in tabular and graphical forms. There is still evidence of additional inter-laboratory variation in comparison with the reference set even when outliers have been taken into account. There remains scope for further examination of this, in particular to examine the effect of standardisation of instrument response to the paprika standard, although it is noted that such procedures are not currently within the scope of the EN13751 standard. As shown in Sections 3.3.4 99.9% of irradiated samples fell into the intermediate or positive bands, compared with 99.7% in round 1. The proportions of unirradiated samples giving positive results has fallen very slightly to 2.3% from 2.8%. Both of these results represent slight improvements in qualitative outcome between the two rounds and suggest that a stable level of performance has been reached. As shown in the previous report there is a correlation between the qualitative performance level and pooled z scores implying that for PSL screening at least it may be possible to combine quantitative indicators with predictive qualitative performance. The data from round 2 are very encouraging – since there has been improvement, readily seen in z score plots, in sample handling in many laboratories, and it has been shown that qualitative outcomes are well reproduced using these, relatively large sets of samples. It may therefore be possible, utilising these results to develop a design for a "sparse" study utilising smaller numbers of samples, and thus capable of being sustained beyond the timescale of this developmental project.

Calibrated PSL measurements were undertaken a successfully by 12 laboratories using a diverse set of irradiation facilities. The results can be shown to be broadly comparable to the reference analyses, with good discrimination between irradiated and unirradiated samples in most cases, and blends being distributed in the calibrated PSL plots in the loci between unirradiated and irradiated samples. In the present study the proportion of samples with very low sensitivity, where calibrated PSL measurements can very usefully call into question the status of negative screening results, was extremely low. Therefore it has not been possible to demonstrate a large impact on qualitative outcomes from screening. Nonetheless interlaboratory differences, potentially attributed to the use of different sources, and perhaps also reflecting variations in sample handling within the guidelines of EN13751, were observed. It would be of interest to explore these differences further in future calibrated PSL rounds, with a sample set that is more critically selected to reveal the impact of such measurements on difficult cases. Against these objectives the results from this round are an encouraging starting point.

For the TL study this round included 18 samples from 6 products, comprising unirradiated, irradiated and blended conditions. The reference analyses showed that it was possible to recover minerals from all products, and that the data sets recovered showed a high degree of internal consistency in both separating irradiated and unirradiated examples and in placing the blends in a concentration ordered sequence. For one sample the reference data identified the presence of small low temperature peaks in the untreated material. Reference analyses comprised 20 preparations per product producing 360 individual TL determinations, equivalent to 180 conventional duplicated TL analyses. All samples in the reference set satisfied the EN1788 requirement for glow 2 sensitivity. Fifteen participants returned data in 241 out of 270 possible TL analyses, the remainder of determinations failing to produce sufficient minerals to satisfy EN1788. Of these some 92.6% of the unirradiated samples 98.9% of the irradiated samples and 62% of the reported results from blends were correctly classified. A small proportion of unirradiated samples were identified as irradiated or containing irradiated material, from four laboratories. One irradiated sample was not successfully identified in one laboratory. For the blends the highest concentrations (10%) were all correctly identified in participants' results; while at lower concentrations laboratories detection rates for the irradiated component were reduced. The qualitative performance is encouraging overall, bearing in mind the sample sizes distributed and the differing equipment used by participants. Temperature control, however, could be improved. Quantitative analyses were also conducted using z scores on the recorded glow ratios. This appears to be informative and to identify some laboratory to laboratory differences, although further work is needed to examine the distribution of the glow ratio variable and to explore other means of distinguishing between the detection conditions of each laboratory, for example by utilising absolute signal levels in comparison with detection limits.

The second round of proficiency testing analysis under this project has again resulted in a high return rate of extremely good and useful data from laboratories engaged in PSL and TL analysis of irradiated foods. Participation in such work represents an important commitment by participants and by the study organisers to the ongoing task of ensuring high analytical quality in routine determinations. It is to be hoped that this work will lead to sustained activities in support of food irradiation analyses.

APPENDIX A: TEST SAMPLE DISTRIBUTION AND STUDY PROTOCOL

PLEASE FAX YOUR REPLY TO LORNA CARMICHAEL / SAFFRON FISK AT 44 1355229898

LABORATORY :

We have received the Proficiency test materials on _____ (date)

Were the test materials in good condition on arrival ? _____

Any other comments :

Food Standards Agency Sponsored Development of Proficiency Testing for Detection of Irradiated Foods. Round 2 (PSL and TL)

1. ROUND 2

The second round of the Food Standards Agency project to develop PT schemes for detection of irradiated foods is now underway. Many thanks for your continued participation in this project. Round 2 involves both PSL measurements, following the very interesting first round trial, and also for some laboratories introduces TL measurements. The data returns should be made electronically using the EXCEL spreadsheets issued. Please enter your **lab number as marked on the samples** (it may be different for the PSL and TL parts) in the data sheets.

The protocols for PSL and TL analysis are summarised here.

2. PSL ANALYSIS

All PSL participants are asked to return screening results from round 2, as outlined below in section 2.1. Some participants have also indicated a desire to continue to perform calibrated PSL measurements as well; this is outlined in section 2.2.

This time you will receive a new sample of irradiated paprika standard material, plus a set of 72 numbered samples for PSL analysis, and some petri dishes.

2.1 PSL Screening

(i) Please set your system up in your normal manner, ready for use in accordance with EN13751.

(ii) Before working on the test samples please dispense and measure **10 different portions of the new irradiated paprika standard**. This is to provide us with a measurement of the sensitivity of your instrument to this new material, and does not form part of the blind trial. For round 2, rather than dispensing these standard samples by volume, please weigh **2 g**. of the standard into the petri dish, shake or spread it to cover the base, and record the counting data. The material may be discarded after measurement. If you wish to re-use the sample petri dish for all 10 paprika measurements you may. But please be careful not to spread irradiated paprika to the outsides of the dishes or to the instrument chamber.

(iii) Then measure the samples using a new pair of petri dishes for each of the numbered test samples. You should dispense and measure these in the numbered sequence using your normal procedure.

Measure each sample in duplicate, and record the PSL screening results in the EXCEL spreadsheet provided by disk and email.

Please be careful when dispensing, handling and measuring the samples to avoid cross-contamination, or contamination of the sample chamber. Some of the samples are irradiated, and may have high sensitivities.

PSL screening results should be returned to the organisers by email (to D.Sanderson@suerc.gla.ac.uk &/or L.Carmichael@suerc.gla.ac.uk) both using the EXCEL spreadsheet and also with a copy of the PSL summary files for the runs used.

2.2 Calibrated PSL

For those laboratories continuing with calibrated PSL measurements, seal your petri dishes and bag them after screening measurements. They should then be irradiated using a gamma or electron beam facility to a dose of 1 kGy. Then after a suitable post-irradiation delay (at least 24 hours) they should be re-measured and evaluated.

Return these results also using the combination of EXCEL spreadsheet and back-up PSL summary file.

3. TL laboratories

Participating TL laboratories are supplied with two LiF TLD:100 chips for temperature scale calibration, and a set of 18 numbered test samples.

The two LiF chips should be measured for TL using the same system as used to read the trial samples, and the full glow curve returned to the organisers (in its normal format) plus an evaluation of the temperature of the main (LiF peak V) band.

The test samples should be prepared in duplicate following EN1788 compatible procedures, including appropriate quality control measures (particularly blanks). Prepared samples should then be read out by TL (typically from 0-400°C at 5°C s^{-1}) to produce **first glow** TL data. The samples should then be irradiated using a ^{60}Co, ^{90}Sr or equivalent radiation course to a dose of 1 kGy, stored or preheated (eg at 50°C for one hour) and then remeasured to obtain **second glow** TL data. Return data for each sample comprising the first glow and second glow intensities, the TL glow ratio, observations on glow1 peak shapes and your evaluation. The samples may be irradiated, untreated, or mixtures containing irradiated materials. Please evaluate your data in these terms.

The TL results should be returned both in the supplied EXCEL spreadsheet (in the TL results page) and with additional supporting data files for the LiF glow curves plus any additional observations that you wish to have considered for evaluation purposes.

4. Return dates

Please return **PSL screening results no later than 2nd June**; for **calibrated PSL by 16th June**, and for **TL results no later than 30th June 2006**.

APPENDIX B – RAW DATA

Table B.1 Reference values based on log statistics for irradiated and unirradiated test materials – calibrated PSL

		Irradiated cal			Unirradiated cal		
SP Number	Description	Log_{10} mean	SD	CV	Log_{10} mean	SD	CV
8511	Italian seasoning	5.29	0.07	1.39%	5.19	0.06	1.20%
8512	Basil	4.61	0.21	4.53%	4.30	0.06	1.39%
8513	Curry no 3	7.23	0.03	0.42%	6.94	0.04	0.61%
8514	BBQ seasoning	7.54	0.10	1.27%	7.28	0.07	0.94%
8515	Cinnamon	4.25	0.13	2.97%	3.88	0.12	3.03%
8516	Paprika	5.58	0.06	1.07%	5.11	0.05	1.06%
8517	Cumin	5.63	0.07	1.25%	5.48	0.07	1.21%
8518	Oregano	5.46	0.10	1.77%	5.33	0.04	0.75%
8519	Ground black pepper	4.75	0.21	4.46%	4.47	0.21	4.60%
8520	Chives	4.22	0.18	4.22%	4.22	0.33	7.80%
8521	Mint	4.48	0.07	1.54%	4.21	0.04	0.96%
8522	Ground white pepper	3.17	0.28	8.98%	2.96	0.19	6.35%
8523	Sage	5.43	0.13	2.37%	5.25	0.08	1.49%
8524	Thai seasoning	7.71	0.16	2.07%	7.64	0.06	0.72%
8525	Ground mixed spice	4.53	0.17	3.86%	4.24	0.19	4.43%
8526	Ground coriander	4.38	0.16	3.75%	4.18	0.09	2.27%
8527	Steak seasoning	7.87	0.06	0.72%	7.41	0.14	1.94%
8528	Medium curry	7.15	0.02	0.27%	6.98	0.05	0.69%
8529	Nutmeg	4.93	0.08	1.69%	4.71	0.17	3.67%
8530	Whole black pepper	3.29	0.16	4.79%	3.16	0.16	4.93%
8531	Ginger	5.38	0.13	2.39%	5.11	0.08	1.59%
8532	Thyme	4.90	0.07	1.49%	4.71	0.03	0.67%
8533	Rosemary	4.77	0.06	1.17%	4.50	0.03	0.65%
8534	Turmeric	4.15	0.02	0.59%	3.93	0.09	2.29%
8535	Chilli powder	5.18	0.05	1.03%	4.96	0.05	1.09%
8536	Garlic powder	5.90	0.08	1.33%	5.82	0.07	1.15%
8537	Mixed herbs	5.22	0.07	1.42%	5.04	0.08	1.60%
8538	Parsley	3.76	0.23	6.12%	3.52	0.18	5.13%
8539	Tarragon	4.49	0.29	6.45%	4.19	0.13	3.04%
8540	Basil	4.42	0.05	1.04%	4.20	0.08	1.88%
8541	Mint	4.67	0.05	1.17%	4.41	0.12	2.61%
8542	Parsley	4.80	0.05	1.14%	4.62	0.07	1.51%
8543	Tarragon	3.83	0.11	2.89%	3.75	0.19	4.99%
8544	Thyme	6.22	0.02	0.36%	6.01	0.05	0.85%
8545	Cinnamon	4.06	0.13	3.23%	3.79	0.08	2.11%
8546	Ground coriander	3.72	0.13	3.49%	3.42	0.09	2.67%
8547	Cumin	4.26	0.06	1.40%	4.04	0.06	1.40%
8548	Paprika	5.11	0.06	1.27%	4.79	0.12	2.48%
8549	Turmeric	4.96	0.09	1.82%	4.65	0.12	2.64%
8571	Milk thistle seed	5.14	0.06	1.23%	4.96	0.08	1.64%
8572	Alfalfa herb	4.54	0.09	2.03%	4.30	0.07	1.52%
8573	Saw palmetto berry	3.55	0.18	4.99%	3.31	0.22	6.60%
8574	Dong quai root	6.03	0.04	0.70%	5.92	0.04	0.68%
8575	Guarana seed	3.67	0.20	5.33%	3.32	0.12	3.57%
8576	Gingko biloba leaves	5.33	0.04	0.72%	5.19	0.07	1.25%
8577	Siberian ginseng	5.87	0.05	0.90%	5.68	0.05	0.86%
8578	Green tea	4.98	0.09	1.82%	4.75	0.13	2.68%
8579	Echinacea	4.99	0.07	1.43%	4.86	0.13	2.70%
8580	Garlic powder	5.90	0.05	0.87%	5.70	0.05	0.82%

Table B.2 Reference data for blended samples

	Linear				Log			
	Mean	SD	SE	CV	Mean	SD	SE	CV
SP8351	21015.40	15521.63	4908.37	73.86%	4.24	0.26	0.08	6.13%
SP8533	691.40	500.97	158.42	72.46%	2.77	0.25	0.08	8.90%
SP8535	931.60	1059.58	335.07	113.74%	2.84	0.29	0.09	10.27%
SP8539	5148.14	2754.43	871.03	53.50%	3.45	0.28	0.09	8.06%
SP8577	10073.70	3606.48	1140.47	35.80%	3.98	0.15	0.05	3.77%
SP8578	484.80	108.71	34.38	22.42%	2.68	0.10	0.03	3.70%

a) screening

	Linear				Log			
	Mean	SD	SE	CV	Mean	SD	SE	CV
SP8351	165260.20	31390.18	9926.45	18.99%	5.21	0.08	0.03	1.62%
SP8533	40215.30	3157.07	998.35	7.85%	4.60	0.03	0.01	0.73%
SP8535	106267.40	37812.79	11957.45	35.58%	5.01	0.13	0.04	2.54%
SP8539	23122.70	10679.65	3377.20	46.19%	4.33	0.18	0.06	4.19%
SP8577	559935.40	52882.23	16722.83	9.44%	5.75	0.04	0.01	0.72%
SP8578	61180.70	13827.13	4372.52	22.60%	4.78	0.10	0.03	2.11%

b) calibrated

Table B.3 Raw data for unirradiated test materials – calibrated PSL

SP	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 6	Pot 7	Pot 8	Pot 9	Pot 10	Mean	SD	CV
8511	124311	174636	172345	138274	195529	136257	158792	148507	172136	138622	155941	22389	14.36%
8512	16132	24527	20025	17319	23798	16826	20080	20625	19930	20623	19989	2747	13.74%
8513	8027697	9531145	7595899	8792558	10295791	9618417	9439472	8437471	7949878	8547162	8823549	869839	9.86%
8514	15029686	17761159	16596225	18435764	21324919	19868612	26472466	20821701	18883158	16972465	19216616	3203575	16.67%
8515	7660	7001	5922	6766	8724	5644	5603	8183	13797	8563	7786	2410	30.95%
8516	164891	128701	126253	149987	120886	127646	121181	126010	105271	139896	131072	16709	12.75%
8517	317713	289945	315485	426044	337408	254494	313305	291928	247751	289703	308378	49876	16.17%
8518	223361	180899	211856	250231	233291	200282	213769	215075	208589	194836	213219	19586	9.19%
8519	19778	74041	36757	16855	21550	27256	30711	17580	32240	49489	32626	17677	54.18%
8520	15384	19390	7809	21671	12093	23581	12291	7511	11333	105097	23616	29154	123.45%
8521	18087	18090	15275	16624	14426	16499	14670	15071	15511	18550	16280	1526	9.37%
8522	628	633	885	811	617	839	1950	853	1989	741	995	523	52.60%
8523	145429	253022	138421	192922	159090	171456	152341	188885	195457	193705	179073	33658	18.80%
8524	32793765	40019983	43555176	45856292	44042568	43382528	48548840	43388938	50013171	51167164	44276843	5304845	11.98%
8525	12446	13570	29077	12098	11673	16579	27123	35912	19605	10963	18905	8807	46.59%
8526	16278	12418	14607	18475	10888	21062	14528	19365	15198	11734	15455	3368	21.79%
8527	36635438	18376016	30018868	32679996	41455927	13457906	25453478	26997806	23208559	23734635	27201863	8353141	30.71%
8528	7457131	9729985	9470072	9012609	10150807	10695855	9678367	9728232	9858988	11303502	9708555	1019189	10.50%
8529	67145	47572	41695	102914	37116	72495	43703	69252	27079	39122	54809	22763	41.53%
8530	896	1049	1254	1937	1726	1057	1838	2017	1016	2494	1528	544	35.59%
8531	97108	119508	145583	163155	134736	150802	142284	92927	146342	124628	131707	23049	17.50%
8532	48463	52082	53367	57135	44638	52486	54640	53221	47641	51496	51517	3660	7.10%
8533	32396	28314	30600	30632	34551	32080	35019	31314	29208	30439	31455	2133	6.78%
8534	12440	10591	8385	7255	10228	8521	9336	6818	7080	6874	8753	1885	21.54%
8535	97975	87569	96507	82548	105819	104967	98528	71314	81938	93997	92116	11054	12.00%
8536	711968	672927	737937	656307	708094	635172	462190	561803	775055	730130	665158	93420	14.04%
8537	104280	166959	126955	103555	108178	102796	109003	102544	80538	111785	111659	22513	20.16%
8538	3067	4354	5131	5000	1698	3948	2724	2177	2038	5093	3523	1346	38.20%
8539	24728	15381	12146	14151	14704	10902	14550	17689	11794	26024	16207	5220	32.21%
8540	16867	13927	15001	16051	11121	15800	15765	23051	17283	15398	16026	3012	18.80%
8541	33755	21131	24790	32832	22170	26179	20982	44762	19953	21906	26846	7959	29.65%
8542	36526	47135	31425	55561	38599	47783	40647	43809	41754	37895	42113	6823	16.20%
8543	5064	4323	7390	11625	9852	4884	6218	5515	2660	4181	6171	2745	44.48%
8544	1316975	1139076	990324	1044169	1082905	1024919	917660	975545	904996	899760	1029633	127813	12.41%
8545	5503	5531	4465	7140	8200	6361	6864	5101	6941	6880	6299	1126	17.88%
8546	2543	2485	2257	3327	3399	2773	3240	2727	1716	2294	2676	535	19.98%
8547	12175	10784	9745	11472	10429	10630	14715	10373	11214	9179	11072	1535	13.86%
8548	63863	61574	62022	42968	64923	102073	59892	52478	42657	87431	63988	18429	28.80%
8549	62861	44309	48757	33702	34810	78848	36108	43696	33598	46479	46317	14554	31.42%
8571	116238	110391	78923	74572	76921	89288	112818	73695	91127	111566	93554	17522	18.73%
8572	19754	21092	15996	24569	23732	19682	20217	16126	22163	17258	20059	2970	14.81%
8573	2799	1486	1378	4241	3920	1735	3356	1113	1575	1239	2284	1185	51.89%
8574	820184	738431	867873	864771	1000367	883548	729644	836450	772735	820145	833415	79155	9.50%
8575	1777	1782	1906	1875	1950	2584	2716	3735	1443	1934	2170	668	30.77%
8576	165002	150555	129431	201677	141517	149142	174504	181116	151989	124632	156957	23860	15.20%
8577	435986	431089	412854	473832	502088	493176	539856	582503	422430	479106	477292	54639	11.45%
8578	41693	45999	61686	80830	60196	70724	94483	48400	45544	40315	58987	18235	30.91%
8579	104369	108365	58761	42956	67785	54471	77439	78608	95777	60437	74897	22117	29.53%
8580	570045	478819	571735	509948	543500	509107	542497	500422	404174	456626	508687	52377	10.30%

Table B.4 Raw data for irradiated test materials – calibrated PSL

SP	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 6	Pot 7	Pot 8	Pot 9	Pot 10	Mean	SD	CV
8511	205012	133563	219983	222758	187541	198042	185207	210055	241356	166984	197050	30820	15.64%
8512	36950	35885	156351	33391	36952	37758	31493	37326	31321	32618	47005	38500	81.91%
8513	15940295	17454502	15954032	16321188	16432017	18495317	17214216	16004401	18980855	18833104	17162993	1224675	7.14%
8514	30511729	22979030	25790752	33689888	35409912	40965138	46446285	39403028	35437912	41488329	35212200	7296649	20.72%
8515	15945	15663	16898	17102	14765	18146	21633	14783	38359	14839	18813	7177	38.15%
8516	423074	296422	394453	357865	386735	390009	439086	334595	343968	466795	383300	51597	13.46%
8517	459632	493724	561377	443819	397695	333192	375511	447807	348913	461538	432321	69608	16.10%
8518	294686	235946	501377	306226	331260	254512	281540	247562	289073	237693	297988	78046	26.19%
8519	99216	54381	38136	65622	164537	42712	37531	51174	37685	42341	63334	40259	63.57%
8520	13805	25207	20134	12246	10910	27739	10089	14175	13658	31898	17986	7757	43.13%
8521	43866	30922	32631	24904	25888	27673	31083	27239	29989	30981	30518	5327	17.46%
8522	2105	1166	1304	1110	1442	8552	1154	925	1130	995	1988	2330	117.19%
8523	170225	267709	339267	286942	172395	265976	358465	213080	328792	396191	279904	77498	27.69%
8524	34697103	28929879	33729531	38753155	62642226	67833960	76377140	63789246	66209421	68778642	54174030	17870766	32.99%
8525	30345	42252	61127	46435	29394	22544	27471	58205	24415	19269	36146	14966	41.40%
8526	20737	61332	34861	20442	24639	20850	17567	20073	18547	21958	26101	13299	50.95%
8527	62859702	79048552	65244265	65935412	78088765	75960545	75871798	76847128	97474796	66238607	74356957	10184395	13.70%
8528	13714686	14710803	13500559	13803206	13946229	13475184	15299674	14978058	14132903	14236428	14179773	627983	4.43%
8529	92647	90515	69013	104811	115615	99213	61485	80791	77382	83563	87504	16480	18.83%
8530	1321	2188	2164	1497	1812	1460	4397	1595	1693	2795	2092	922	44.08%
8531	309141	264624	237577	241497	196963	448462	250712	164018	181971	186088	248105	83139	33.51%
8532	76978	78579	76000	64025	78543	80745	117998	76509	67305	91295	80798	14994	18.56%
8533	75863	51555	56422	60876	54742	53208	50745	67276	62215	54833	58774	7926	13.49%
8534	14282	13654	15181	14648	14823	12920	13747	15646	14407	13770	14308	810	5.66%
8535	165649	158439	144594	182215	134819	163733	153205	134490	119652	153930	151073	18190	12.04%
8536	663803	954660	632301	1119455	802072	834005	630645	806464	752535	817118	801306	150944	18.84%
8537	131628	163098	213688	136943	186619	193846	138559	167776	153987	197092	168324	28523	16.95%
8538	6486	4198	2725	4958	3994	20527	6871	6530	6126	4881	6730	5026	74.68%
8539	21296	21930	24484	22308	24476	38455	32744	192770	23319	24257	42604	53044	124.51%
8540	23759	25601	24694	24960	30842	24896	28904	28961	27221	21756	26159	2771	10.59%
8541	41298	48859	61036	44537	48744	45028	44358	51046	41847	39869	46662	6197	13.28%
8542	60206	51148	73894	72176	64167	62968	68380	52286	69279	60426	63493	7745	12.20%
8543	7378	5889	6836	7694	5572	9357	5419	4262	9056	8525	6999	1701	24.30%
8544	1681549	1714240	1604792	1554809	1801888	1701555	1704925	1803930	1571401	1642304	1678139	86272	5.14%
8545	10845	13067	10181	8298	10586	17496	20534	7860	10695		12174	4229	34.74%
8546	10303	8203	6366	3294	5060	4989	5037	7231	5107	6052	3286	1992	60.61%
8547	19889	18599	18668	17661	22505	15548	18699	15718	14473	20556	18232	2470	13.55%
8548	112485	128866	111231	135256	128072	168499	145477	142765	101446	122285	129638	19579	15.10%
8549	74809	86536	82440	87361	99000	82916	131758	92327	125180	68104	93043	20580	22.12%
8571	150936	156871	152879	178261	112120	132837	131899	117584	122694	146859	140294	20484	14.60%
8572	40157	39564	30496	52932	26932	37761	29039	29226	29321	38212	35364	7973	22.55%
8573	2753	3757	5573	3585	2725	2884	2101	8330	2620	4021	3835	1859	48.49%
8574	1171395	1164631	1057568	999988	1063220	964566	1085723	949237	1274135	974717	1070518	105952	9.90%
8575	4055	4391	4724	4022	14378	5508	4833	3156	4600	2631	5230	3320	63.47%
8576	189752	242044	211731	208093	220578	237932	207004	241089	214728	190608	216356	19164	8.86%
8577	903049	819138	746424	772496	755818	711804	724061	751250	794219	561518	753978	87059	11.55%
8578	134763	129319	97620	86958	77496	76716	81962	101404	76716	102775	96573	21219	21.97%
8579	134763	129319	97620	86958	77496	76716	81962	101404	76716	102775	96573	21219	21.97%
8580	739471	781331	1041743	801144	827719	726787	834829	781923	686038	709231	793022	100477	12.67%

Table B.5 Raw data for homogeneity testing of blended samples - screening

SP	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 6	Pot 7	Pot 8	Pot 9	Pot 10	Mean	SD	CV
8531	8989	45122	11516	12373	17718	12305	11552	53863	16332	20384	21015	15522	73.86%
8533	2021	242	786	394	551	833	392	522	662	511	691	501	72.46%
8535	645	381	593	489	3898	560	456	836	1006	452	932	1060	113.74%
8539	3194	6254	10240	2068	1247	3283	2334	2430	1367	2526	3494	2754	78.83%
8577	7080	17855	11459	12239	9616	7144	5819	10736	6876	11913	10074	3606	35.80%
8578	339	604	491	670	491	352	564	379	505	453	485	109	22.42%

Table B.6 Raw data for homogeneity testing of blended samples – calibrated

SP	Pot 1	Pot 2	Pot 3	Pot 4	Pot 5	Pot 6	Pot 7	Pot 8	Pot 9	Pot 10	Mean	SD	CV
8531	193375	151100	212606	149594	140099	190742	113002	159045	196617	146422	165260.2	31390.18	18.99%
8533	46740	40186	40409	43853	35456	39001	40635	39033	39346	37494	40215.3	3157.065	7.85%
8535	115051	74743	77814	115621	83172	86666	104694	205160	92172	107581	106267.4	37812.79	35.58%
8539	26057	31705	47843	14624	13660	14195	25237	13989	21232	22685	23122.7	10679.65	46.19%
8577	552352	615177	554081	492794	502941	602737	616370	626743	492731	543428	559935.4	52882.23	9.44%
8578	39329	65200	69402	80236	48451	53277	51719	65173	56711	82309	61180.7	13827.13	22.60%

Table B.7 Reference values for TL Homogeneity Testing based on Glow Ratio

	Mean	SD
Ginger U	-2.44737	0.211783
Rosemary U	-2.94587	0.534393
Chilli U	-2.85467	0.241645
Tarragon U	-2.45061	0.584921
Ginseng U	-2.31409	0.110042
Green Tea U	-2.4126	0.118619
Ginger I	0.49417	0.094234
Rosemary I	0.295098	0.052178
Chilli I	0.220145	0.065008
Tarragon I	0.357058	0.097278
Ginseng I	0.31036	0.05731
Green Tea I	0.308111	0.046717
Ginger B	-0.5351	0.288699
Rosemary B	-1.66684	0.332742
Chilli B	-2.4516	0.742994
Tarragon B	-0.73895	0.512392
Ginseng B	-1.25363	0.08994
Green Tea B	-2.34651	0.328888

APPENDIX C – PARTICIPANTS' RAW DATA

Table C.1 Raw Data Returned By Laboratory 1 – screening of unirradiated samples

SP number	Status	Code number	Lab 1	
			Pot 1	Pot 2
8512	U	67	345	380
8513	U	31	367	377
8514	U	56	1074	908
8515	U	42	350	186
8516	U	25	977	813
8517	U	58	373	485
8518	U	54	238	295
8519	U	39	166	309
8520	U	68	327	524
8521	U	3	239	302
8523	U	12	397	292
8525	U	1	818	820
8526	U	59	385	267
8528	U	10	335	346
8529	U	11	416	254
8530	U	23	246	205
8531	U	29	622	876
8532	U	27	321	320
8533	U	14	309	316
8534	U	4	329	238
8535	U	53	482	580
8536	U	19	1374	1492
8538	U	61	167	428
8539	U	20	286	410
8571	U	9	589	371
8572	U	6	357	371
8573	U	60	235	313
8574	U	70	1285	1150
8575	U	71	257	381
8576	U	13	319	441
8577	U	55	2314	2600
8578	U	28	322	398
8579	U	57	308	321

Non-negative results shaded

Table C.2 Raw Data Returned By Laboratory 1 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 1	
			Pot 1	Pot 2
8512	I	47	25370	26239
8513	I	26	12812648	12073490
8514	I	64	16211998	18186510
8515	I	35	8267	11678
8516	I	18	184264	190536
8517	I	5	384688	324003
8518	I	33	234603	266577
8519	I	24	57810	43263
8520	I	69	13056	10325
8521	I	38	17858	25178
8523	I	32	246477	344781
8525	I	8	22605	36455
8526	I	50	15856	12942
8528	I	62	8938396	9686189
8529	I	51	66732	154530
8530	I	21	1742	947
8531	I	45	283706	399343
8532	I	49	62853	142591
8533	I	15	48223	48418
8534	I	65	5735	7590
8535	I	66	115857	84560
8536	I	44	1149989	1035595
8538	I	16	2075	3864
8539	I	48	14193	22554
8571	I	34	593782	665066
8572	I	41	32733	44585
8573	I	7	2534	6833 / 1684
8574	I	40	1023518	941434
8575	I	63	1877	2146
8576	I	52	191167	203506
8577	I	22	157651	114192
8578	I	37	130081	63914
8579	I	43	97608	99827
8531	B	72	43805	13634
8533	B	17	802	364
8535	B	30	571	572
8539	B	36	1033	1237
8577	B	2	5976	7695
8578	B	46	361	378

Table C.3 Raw Data Returned By Laboratory 1 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 1	
			Pot 1	Pot 2
8512	U	67	15023	16009
8513	U	31	9931242	11409380
8514	U	56	56912073*	63534172*
8515	U	42	7185	10605
8516	U	25	701000	358609
8517	U	58	266870	213119
8518	U	54	154833	149483
8519	U	39	16730	15109
8520	U	68	11567	20614
8521	U	3	12439	13845
8523	U	12	126552	109817
8525	U	1	13264	29187
8526	U	59	10136	11195
8528	U	10	37391569*	35153118*
8529	U	11	41986	29839
8530	U	23	1098	875
8531	U	29	119518	156964
8532	U	27	37817	28825
8533	U	14	28043	31168
8534	U	4	3454	4729
8535	U	53	46042	72711
8536	U	19	457399	464508
8538	U	61	2669	5397
8539	U	20	16538	10474
8571	U	9	62632	67571
8572	U	6	11870	15930
8573	U	60	1745	2281
8574	U	70	618897	696057
8575	U	71	2870	2656
8576	U	13	130508	125174
8577	U	55	342980	319177
8578	U	28	47965	41214
8579	U	57	47285	31911

* participant has identified but not corrected overflows

Table C.4 Raw Data Returned By Laboratory 1 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 1	
			Pot 1	Pot 2
8512	I	47	23954	23175
8513	I	26	40961101*	35408813*
8514	I	64	88375230*	82523750**
8515	I	35	9680	8226
8516	I	18	619880	765705
8517	I	5	327568	313269
8518	I	33	200509	207198
8519	I	24	28836	35852
8520	I	69	13881	23372
8521	I	38	19575	17509
8523	I	32	216782	164077
8525	I	8	23883	43121
8526	I	50	12961	15644
8528	I	62	36146369*	39914149*
8529	I	51	86807	200646
8530	I	21	1737	1112
8531	I	45	216683	313006
8532	I	49	79474	104691
8533	I	15	45818	40928
8534	I	65	6641	8054
8535	I	66	84442	89264
8536	I	44	611404	870954
8538	I	16	3332	3129
8539	I	48	23912	23328
8571	I	34	485860	517646
8572	I	41	23980	34659
8573	I	7	1183	1718
8574	I	40	1091575	1084291
8575	I	63	3050	5430
8576	I	52	164187	173440
8577	I	22	155204	118657
8578	I	37	114151	69101
8579	I	43	85701	111550
8531	B	72	149224	168478
8533	B	17	28150	27213
8535	B	30	53318	61713
8539	B	36	8569	10435
8577	B	2	368419	437021
8578	B	46	46881	103791

* participant has identified but not corrected overflows

Table C.5 Raw Data Returned By Laboratory 2 – screening of unirradiated samples

SP number	Status	Code number	Lab 2	
			Pot 1	Pot 2
8512	U	67	288	319
8513	U	31	220	368
8514	U	56	873	1060
8515	U	42	258	297
8516	U	25	1129	1434
8517	U	58	487	629
8518	U	54	377	394
8519	U	39	359	264
8520	U	68	369	323
8521	U	3	320	291
8523	U	12	387	372
8525	U	1	1397	763
8526	U	59	388	532
8528	U	10	374	608
8529	U	11	367	331
8530	U	23	283	300
8531	U	29	1216	1031
8532	U	27	455	380
8533	U	14	362	339
8534	U	4	287	363
8535	U	53	442	515
8536	U	19	3829	1759
8538	U	61	924	1024
8539	U	20	354	356
8571	U	9	376	394
8572	U	6	363	405
8573	U	60	2319	2777
8574	U	70	1568	894
8575	U	71	222	276
8576	U	13	433	542
8577	U	55	2285	2701
8578	U	28	553	1191
8579	U	57	382	328

Non-negative results shaded

Table C.6 Raw Data Returned By Laboratory 2 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 2	
			Pot 1	Pot 2
8512	I	47	28655	21669
8513	I	26	12153397	1323394
8514	I	64	6992832	15041014
8515	I	35	9536	13448
8516	I	18	217089	359230
8517	I	5	310442	370979
8518	I	33	167288	227632
8519	I	24	33212	44696
8520	I	69	6338	15280
8521	I	38	60398	19003
8523	I	32	142492	194092
8525	I	8	60332	24770
8526	I	50	10415	21349
8528	I	62	2554108	16658787
8529	I	51	59218	71593
8530	I	21	1009	1409
8531	I	45	138189	168069
8532	I	49	61799	77150
8533	I	15	44840	47362
8534	I	65	16186	13087
8535	I	66	76481	97465
8536	I	44	583379	606412
8538	I	16	1839	2947
8539	I	48	40015	17109
8571	I	34	612883	694439
8572	I	41	30806	23109
8573	I	7	1926	2143
8574	I	40	856570	1024047
8575	I	63	3161	11340
8576	I	52	185977	164907
8577	I	22	107139	126581
8578	I	37	80555	69986
8579	I	43	93250	108730
8531	B	72	10308	10771
8533	B	17	321	395
8535	B	30	659	704
8539	B	36	1627	1189
8577	B	2	25846	9547
8578	B	46	459	609

Table C.7 Raw Data Returned By Laboratory 3 – screening of unirradiated samples

SP number	Status	Code number	Lab 3	
			Pot 1	Pot 2
8512	U	67	326	210
8513	U	31	291	166
8514	U	56	1169	1437
8515	U	42	270	154
8516	U	25	1484	833
8517	U	58	502	516
8518	U	54	225	322
8519	U	39	176	431
8520	U	68	640	205
8521	U	3	287	352
8523	U	12	356	387
8525	U	1	366	611
8526	U	59	320	338
8528	U	10	478	971
8529	U	11	885	417
8530	U	23	80	276
8531	U	29	610	562
8532	U	27	143	407
8533	U	14	300	353
8534	U	4	380	324
8535	U	53	685	1079
8536	U	19	974	2435
8538	U	61	327	297
8539	U	20	350	526
8571	U	9	392	410
8572	U	6	525	344
8573	U	60	304	436
8574	U	70	1395	2066
8575	U	71	311	267
8576	U	13	508	705
8577	U	55	3361	3671
8578	U	28	531	764
8579	U	57	314	382

Non-negative results shaded

Table C.8 Raw Data Returned By Laboratory 3 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 3	
			Pot 1	Pot 2
8512	I	47	27255	25912
8513	I	26	9425926	2342188
8514	I	64	1873048	2351920
8515	I	35	27921	42858
8516	I	18	1454923	1589263
8517	I	5	901051	894510
8518	I	33	343884	222553
8519	I	24	57661	33253
8520	I	69	16675	13576
8521	I	38	31290	27368
8523	I	32	277585	270206
8525	I	8	21630	34545
8526	I	50	42076	20805
8528	I	62	12481875	10124928
8529	I	51	110584	86368
8530	I	21	1768	1922
8531	I	45	204514	270074
8532	I	49	85808	72769
8533	I	15	64793	74555
8534	I	65	7487	7110
8535	I	66	118457	213128
8536	I	44	1365643	981635
8538	I	16	11466	6276
8539	I	48	70740	45639
8571	I	34	553473	552686
8572	I	41	44636	49004
8573	I	7	5693	2569
8574	I	40	1334573	1516933
8575	I	63	3081	3370
8576	I	52	308715	328936
8577	I	22	148935	189186
8578	I	37	122117	115421
8579	I	43	158702	150525
8531	B	72	21479	12221
8533	B	17	2257	1271
8535	B	30	693	731
8539	B	36	19730	2141
8577	B	2	6866	11234
8578	B	46	277	488

Table C.9 Raw Data Returned By Laboratory 5 – screening of unirradiated samples

SP number	Status	Code number	Lab 5	
			Pot 1	Pot 2
8512	U	67	440	336
8513	U	31	536	511
8514	U	56	1641	2490
8515	U	42	438	375
8516	U	25	2364	903
8517	U	58	196	522
8518	U	54	412	438
8519	U	39	313	257
8520	U	68	226	374
8521	U	3	382	313
8523	U	12	327	199
8525	U	1	903	1944
8526	U	59	158	220
8528	U	10	278	388
8529	U	11	338	565
8530	U	23	285	366
8531	U	29	804	522
8532	U	27	426	414
8533	U	14	301	663
8534	U	4	310	354
8535	U	53	979	1543
8536	U	19	1816	10777
8538	U	61	389	454
8539	U	20	334	469
8571	U	9	653	534
8572	U	6	366	480
8573	U	60	385	299
8574	U	70	2123	1815
8575	U	71	428	392
8576	U	13	518	518
8577	U	55	7001	4630
8578	U	28	447	541
8579	U	57	339	505

Table C.10 Raw Data Returned By Laboratory 5 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 5	
			Pot 1	Pot 2
8512	I	47	36351	36529
8513	I	26	2857873	5152301
8514	I	64	9583298	514910
8515	I	35	30233	16228
8516	I	18	457332	488801
8517	I	5	660384	720439
8518	I	33	298382	377938
8519	I	24	67050	106411
8520	I	69	64881	27921
8521	I	38	43376	51329
8523	I	32	459919	364415
8525	I	8	34091	47218
8526	I	50	27492	45917
8528	I	62	4517074	4086563
8529	I	51	181758	135146
8530	I	21	2470	2790
8531	I	45	306196	541091
8532	I	49	150867	180809
8533	I	15	84503	76808
8534	I	65	7290	9101
8535	I	66	192335	211131
8536	I	44	2063093	1227166
8538	I	16	3502	4822
8539	I	48	16466	27692
8571	I	34	1343951	1381383
8572	I	41	50109	37345
8573	I	7	5194	23739
8574	I	40	1673935	1612547
8575	I	63	13577	5299
8576	I	52	434031	331636
8577	I	22	296764	181895
8578	I	37	127073	147275
8579	I	43	135809	140487
8531	B	72	27648	17454
8533	B	17	1255	727
8535	B	30	2858	774
8539	B	36	1705	2038
8577	B	2	15699	14003
8578	B	46	515	634

Table C.11 Raw Data Returned By Laboratory 6 – screening of unirradiated samples

SP number	Status	Code number	Lab 6	
			Pot 1	Pot 2
8512	U	67	393	295
8513	U	31	2007	1612
8514	U	56	2137	2219
8515	U	42	1835	1535
8516	U	25	3231	1640
8517	U	58	1242	970
8518	U	54	1012	835
8519	U	39	1551	1249
8520	U	68	611	544
8521	U	3	576	328
8523	U	12	450	555
8525	U	1	697	3297
8526	U	59	1442	960
8528	U	10	558	522
8529	U	11	563	508
8530	U	23	439	360
8531	U	29	2512	4446
8532	U	27	2265	1954
8533	U	14	399	424
8534	U	4	421	335
8535	U	53	1418	1206
8536	U	19	1773	1687
8538	U	61	431	605
8539	U	20	528	621
8571	U	9	744	537
8572	U	6	614	704
8573	U	60	716	479
8574	U	70	1853	1750
8575	U	71	544	422
8576	U	13	534	807
8577	U	55	5499	3451
8578	U	28	2297	2539
8579	U	57	925	921

Non-negative results shaded

Table C.12 Raw Data Returned By Laboratory 6 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 6	
			Pot 1	Pot 2
8512	I	47	39024	42940
8513	I	26	10258283	5097008
8514	I	64	11523933	1435797
8515	I	35	13905	19107
8516	I	18	974182	920214
8517	I	5	522103	665723
8518	I	33	645083	630362
8519	I	24	50417	74159
8520	I	69	16983	32513
8521	I	38	42587	57013
8523	I	32	383866	669992
8525	I	8	28146	38664
8526	I	50	27026	23443
8528	I	62	6690026	4537385
8529	I	51	130386	76019
8530	I	21	1766	821
8531	I	45	342272	459322
8532	I	49	122730	114389
8533	I	15	80574	89546
8534	I	65	14004	11546
8535	I	66	166956	206351
8536	I	44	1606337	1282496
8538	I	16	13138	5985
8539	I	48	44503	50762
8571	I	34	957256	1174846
8572	I	41	71131	88111
8573	I	7	6400	3842
8574	I	40	1715013	2153031
8575	I	63	46430	6879
8576	I	52	312142	306764
8577	I	22	251074	187240
8578	I	37	116852	134786
8579	I	43	171389	168463
8531	B	72	263840	19647
8533	B	17	1018	1721
8535	B	30	3271	2365
8539	B	36	4349	16388
8577	B	2	16377	13989
8578	B	46	1622	1412

Table C.13 Raw Data Returned By Laboratory 8 – screening of unirradiated samples

SP number	Status	Code number	Lab 8	
			Pot 1	Pot 2
8512	U	67	287	472
8513	U	31	513	359
8514	U	56	1439	1526
8515	U	42	228	361
8516	U	25	2188	1074
8517	U	58	372	575
8518	U	54	465	318
8519	U	39	456	347
8520	U	68	513	386
8521	U	3	285	417
8523	U	12	399	262
8525	U	1	1505	895
8526	U	59	249	265
8528	U	10	515	491
8529	U	11	387	437
8530	U	23	290	251
8531	U	29	1055	971
8532	U	27	543	427
8533	U	14	278	398
8534	U	4	339	360
8535	U	53	926	1021
8536	U	19	2356	4926
8538	U	61	315	403
8539	U	20	401	453
8571	U	9	385	580
8572	U	6	591	572
8573	U	60	342	216
8574	U	70	2394	1922
8575	U	71	220	277
8576	U	13	701	517
8577	U	55	4762	6975
8578	U	28	577	459
8579	U	57	419	486

Table C.14 Raw Data Returned By Laboratory 8 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 8	
			Pot 1	Pot 2
8512	I	47	38255	66437
8513	I	26	5013003	5777319
8514	I	64	9005901	11765444
8515	I	35	40121	63660
8516	I	18	441489	487474
8517	I	5	617732	612078
8518	I	33	460973	340141
8519	I	24	96630	97581
8520	I	69	26495	21684
8521	I	38	38005	32330
8523	I	32	283332	627800
8525	I	8	33015	61945
8526	I	50	50372	31481
8528	I	62	2256229	2982021
8529	I	51	113874	113438
8530	I	21	2481	2360
8531	I	45	627485	415256
8532	I	49	113881	135969
8533	I	15	72593	80428
8534	I	65	11781	15579
8535	I	66	180232	160485
8536	I	44	1560909	2115277
8538	I	16	4432	6578
8539	I	48	56541	36352
8571	I	34	1305640	1510217
8572	I	41	71578	74609
8573	I	7	5032	3614
8574	I	40	1888955	2080817
8575	I	63	4168	16497
8576	I	52	430785	347337
8577	I	22	199962	404080
8578	I	37	121127	171051
8579	I	43	379977	246661
8531	B	72	22529	22544
8533	B	17	1333	1417
8535	B	30	811	1453
8539	B	36	3088	1500
8577	B	2	19498	33047
8578	B	46	691	699

Table C.15 Raw Data Returned By Laboratory 9 – screening of unirradiated samples

SP number	Status	Code number	Lab 9	
			Pot 1	Pot 2
8512	U	67	334	353
8513	U	31	151	535
8514	U	56	2320	1706
8515	U	42	239	251
8516	U	25	1468	1780
8517	U	58	<0	61
8518	U	54	322	408
8519	U	39	181	306
8520	U	68	386	430
8521	U	3	221	316
8523	U	12	307	229
8525	U	1	752	607
8526	U	59	447	217
8528	U	10	338	503
8529	U	11	309	250
8530	U	23	162	262
8531	U	29	547	438
8532	U	27	708	708
8533	U	14	300	371
8534	U	4	386	378
8535	U	53	244	656
8536	U	19	3357	1307
8538	U	61	317	298
8539	U	20	191	472
8571	U	9	460	256
8572	U	6	405	314
8573	U	60	331	325
8574	U	70	1010	1132
8575	U	71	284	356
8576	U	13	437	478
8577	U	55	2983	2609
8578	U	28	495	304
8579	U	57	199	335

Non-negative results shaded

Table C.16 Raw Data Returned By Laboratory 9 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 9	
			Pot 1	Pot 2
8512	I	47	27287	28794
8513	I	26	16746256	1851754
8514	I	64	2715956	5639558
8515	I	35	12510	14795
8516	I	18	690769	1109477
8517	I	5	357292	380636
8518	I	33	148278	194996
8519	I	24	32684	28622
8520	I	69	28114	23031
8521	I	38	25680	24876
8523	I	32	310872	196710
8525	I	8	29494	19700
8526	I	50	28601	19714
8528	I	62	16602262	2675379
8529	I	51	102620	90064
8530	I	21	1892	1787
8531	I	45	236624	207396
8532	I	49	70549	72271
8533	I	15	52791	51415
8534	I	65	9187	8531
8535	I	66	111036	122731
8536	I	44	633165	495479
8538	I	16	2840	2725
8539	I	48	42484	24962
8571	I	34	599227	794649
8572	I	41	25237	33911
8573	I	7	36889	9241
8574	I	40	1050054	1074282
8575	I	63	7602	2783
8576	I	52	187041	214453
8577	I	22	159955	165979
8578	I	37	69955	78913
8579	I	43	118905	107451
8531	B	72	12773	11780
8533	B	17	621	780
8535	B	30	731	475
8539	B	36	699	818
8577	B	2	8604	12463
8578	B	46	549	561

Table C.17 Raw Data Returned By Laboratory 11 – screening of un irradiated samples

SP number	Status	Code number	Lab 11	
			Pot 1	Pot 2
8512	U	67	379	388
8513	U	31	478	434
8514	U	56	1271	1387
8515	U	42	393	409
8516	U	25	1092	2330
8517	U	58	409	520
8518	U	54	476	407
8519	U	39	380	359
8520	U	68	359	580
8521	U	3	376	390
8523	U	12	401	401
8525	U	1	713	961
8526	U	59	420	332
8528	U	10	464	438
8529	U	11	538	374
8530	U	23	305	270
8531	U	29	833	858
8532	U	27	455	484
8533	U	14	313	376
8534	U	4	310	359
8535	U	53	738	887
8536	U	19	1898	14830
8538	U	61	341	407
8539	U	20	442	388
8571	U	9	515	475
8572	U	6	357	466
8573	U	60	335	440
8574	U	70	1777	1843
8575	U	71	412	378
8576	U	13	500	551
8577	U	55	3409	3555
8578	U	28	659	555
8579	U	57	349	378

Non-negative results shaded

Table C.18 Raw Data Returned By Laboratory 11 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 11	
			Pot 1	Pot 2
8512	I	47	92107	34431
8513	I	26	103113	1362074
8514	I	64	15247364	7288572
8515	I	35	15213	11837
8516	I	18	634327	268979
8517	I	5	564823	626304
8518	I	33	370651	464098
8519	I	24	80293	58550
8520	I	69	15089	47461
8521	I	38	33531	34743
8523	I	32	328068	486060
8525	I	8	51606	72291
8526	I	50	29625	31377
8528	I	62	8978821	2877814
8529	I	51	121618	103858
8530	I	21	1928	1163
8531	I	45	271178	386885
8532	I	49	98112	118126
8533	I	15	101792	77585
8534	I	65	10036	15885
8535	I	66	127918	157657
8536	I	44	1330046	1721133
8538	I	16	10367	16936
8539	I	48	38849	29391
8571	I	34	1270579	1222728
8572	I	41	41337	50489
8573	I	7	5489	2528
8574	I	40	1459218	1810176
8575	I	63	7655	9380
8576	I	52	267254	295124
8577	I	22	139744	164785
8578	I	37	127468	148546
8579	I	43	263425	178994
8531	B	72	37949	20481
8533	B	17	672	797
8535	B	30	1933	1042
8539	B	36	1848	1733
8577	B	2	17399	27486
8578	B	46	666	3719

Table C.19 Raw Data Returned By Laboratory 12 – screening of unirradiated samples

SP number	Status	Code number	Lab 12	
			Pot 1	Pot 2
8512	U	67	223	267
8513	U	31	220	403
8514	U	56	1610	2494
8515	U	42	299	287
8516	U	25	1582	1658
8517	U	58	436	331
8518	U	54	429	217
8519	U	39	223	65
8520	U	68	387	394
8521	U	3	345	290
8523	U	12	354	229
8525	U	1	2837	933
8526	U	59	360	755
8528	U	10	387	362
8529	U	11	265	556
8530	U	23	286	230
8531	U	29	268	436
8532	U	27	331	353
8533	U	14	481	226
8534	U	4	306	201
8535	U	53	996	1513
8536	U	19	5394	3171
8538	U	61	235	412
8539	U	20	372	473
8571	U	9	439	456
8572	U	6	275	164
8573	U	60	275	249
8574	U	70	1509	3166
8575	U	71	396	354
8576	U	13	606	744
8577	U	55	5175	3746
8578	U	28	563	581
8579	U	57	390	486

Non-negative results shaded

Table C.20 Raw Data Returned By Laboratory 12 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 12	
			Pot 1	Pot 2
8512	I	47	53557	49887
8513	I	26	14089009	11001777
8514	I	64	4319319	16715966
8515	I	35	20271	25944
8516	I	18	922293	690070
8517	I	5	574654	702196
8518	I	33	310569	656315
8519	I	24	104397	116189
8520	I	69	27043	45739
8521	I	38	31634	45112
8523	I	32	577206	393358
8525	I	8	41980	58165
8526	I	50	29174	44932
8528	I	62	2622708	9937559
8529	I	51	150619	124756
8530	I	21	4368	1852
8531	I	45	354004	422850
8532	I	49	368979	146646
8533	I	15	80117	85660
8534	I	65	11777	31280
8535	I	66	163716	163240
8536	I	44	1284868	1181836
8538	I	16	5127	3291
8539	I	48	47738	65751
8571	I	34	1125758	1057626
8572	I	41	49909	41860
8573	I	7	3035	4102
8574	I	40	1988114	1804061
8575	I	63	7248	5506
8576	I	52	414450	444712
8577	I	22	218021	283802
8578	I	37	110446	104964
8579	I	43	161514	282455
8531	B	72	19799	20209
8533	B	17	1871	606
8535	B	30	998	849
8539	B	36	3840	2467
8577	B	2	18118	13101
8578	B	46	369	487

Table C.21 Raw Data Returned By Laboratory 14 – screening of unirradiated samples

SP number	Status	Code number	Lab 14	
			Pot 1	Pot 2
8512	U	67	198	365
8513	U	31	418	327
8514	U	56	1040	1828
8515	U	42	262	290
8516	U	25	976	717
8517	U	58	433	125
8518	U	54	352	311
8519	U	39	383	230
8520	U	68	577	325
8521	U	3	472	352
8523	U	12	302	218
8525	U	1	868	729
8526	U	59	524	292
8528	U	10	806	347
8529	U	11	1174	349
8530	U	23	331	267
8531	U	29	719	572
8532	U	27	446	327
8533	U	14	237	337
8534	U	4	352	374
8535	U	53	564	645
8536	U	19	1342	1807
8538	U	61	437	367
8539	U	20	259	475
8571	U	9	1712	540
8572	U	6	270	537
8573	U	60	550	277
8574	U	70	1193	1430
8575	U	71	221	317
8576	U	13	470	392
8577	U	55	3395	3770
8578	U	28	554	299
8579	U	57	381	349

Non-negative results shaded

Table C.22 Raw Data Returned By Laboratory 14 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 14	
			Pot 1	Pot 2
8512	I	47	32773	31281
8513	I	26	13358561	14234501
8514	I	64	1130402	6365294
8515	I	35	11347	11061
8516	I	18	455956	465202
8517	I	5	413321	408508
8518	I	33	205260	265050
8519	I	24	56235	41743
8520	I	69	12950	12741
8521	I	38	33784	25559
8523	I	32	373461	548651
8525	I	8	22546	34149
8526	I	50	32906	23379
8528	I	62	3757791	5760608
8529	I	51	75991	96123
8530	I	21	1513	1585
8531	I	45	240597	227576
8532	I	49	114305	99591
8533	I	15	66449	70117
8534	I	65	7413	8067
8535	I	66	157987	110003
8536	I	44	835039	844666
8538	I	16	7243	2753
8539	I	48	51948	31314
8571	I	34	864916	655695
8572	I	41	16911	35983
8573	I	7	2842	8538
8574	I	40	1242739	1106701
8575	I	63	3973	4928
8576	I	52	306522	281536
8577	I	22	177387	172988
8578	I	37	75930	162278
8579	I	43	153095	133370
8531	B	72	51402	34795
8533	B	17	1055	1816
8535	B	30	589	481
8539	B	36	4500	5860
8577	B	2	7851	27144
8578	B	46	403	502

Table C.23 Raw Data Returned By Laboratory 14 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 14	
			Pot 1	Pot 2
8512	U	67	3414	4554
8513	U	31	3751559	3600757
8514	U	56	12955295	6848282
8515	U	42	1321	823
8516	U	25	73654	69123
8517	U	58	44709	35881
8518	U	54	26934	22509
8519	U	39	4916	3830
8520	U	68	1015	3081
8521	U	3	2470	3288
8523	U	12	23280	14410
8525	U	1	2125	4111
8526	U	59	1544	3689
8528	U	10	5385095	3631067
8529	U	11	6899	6788
8530	U	23	454	441
8531	U	29	20114	33118
8532	U	27	7290	5013
8533	U	14	5539	3735
8534	U	4	1194	806
8535	U	53	10981	8047
8536	U	19	76491	75512
8538	U	61	657	643
8539	U	20	1439	2916
8571	U	9	14178	13237
8572	U	6	2352	2082
8573	U	60	810	323
8574	U	70	83300	81123
8575	U	71	560	584
8576	U	13	18566	23641
8577	U	55	52547	43508
8578	U	28	11761	6354
8579	U	57	7756	6503

Table C.24 Raw Data Returned By Laboratory 14 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 14	
			Pot 1	Pot 2
8512	I	47	14865	15272
8513	I	26	8878492	7655782
8514	I	64	13467789	12423490
8515	I	35	3717	6571
8516	I	18	747328	266928
8517	I	5	59854	60715
8518	I	33	62871	59281
8519	I	24	27239	23461
8520	I	69	16711	10827
8521	I	38	11941	19098
8523	I	32	94996	147651
8525	I	8	3571	4723
8526	I	50	8348	7972
8528	I	62	12684636	6109259
8529	I	51	25273	35103
8530	I	21	712	991
8531	I	45	17267	24804
8532	I	49	44324	41338
8533	I	15	16842	19668
8534	I	65	1738	3063
8535	I	66	55848	58278
8536	I	44	121044	29730
8538	I	16	1682	1182
8539	I	48	14011	15447
8571	I	34	192636	145546
8572	I	41	3801	4575
8573	I	7	428	797
8574	I	40	275377	237089
8575	I	63	1470	1462
8576	I	52	116371	107371
8577	I	22	38033	32022
8578	I	37	26743	37787
8579	I	43	12617	15067
8531	B	72	30791	30446
8533	B	17	3581	4275
8535	B	30	11568	5904
8539	B	36	2741	2453
8577	B	2	97359	48740
8578	B	46	16699	7144

Table C.25 Raw Data Returned By Laboratory 16 –screening of unirradiated samples

SP number	Status	Code number	Lab 16	
			Pot 1	Pot 2
8512	U	67	299	262
8513	U	31	397	308
8514	U	56	1517	1700
8515	U	42	292	469
8516	U	25	2240	2995
8517	U	58	598	590
8518	U	54	321	245
8519	U	39	296	289
8520	U	68	439	328
8521	U	3	219	285
8523	U	12	346	389
8525	U	1	778	792
8526	U	59	261	357
8528	U	10	399	243
8529	U	11	398	484
8530	U	23	228	202
8531	U	29	573	566
8532	U	27	198	325
8533	U	14	245	258
8534	U	4	288	399
8535	U	53	815	1135
8536	U	19	4321	4514
8538	U	61	220	331
8539	U	20	284	249
8571	U	9	339	347
8572	U	6	259	362
8573	U	60	231	356
8574	U	70	1696	1969
8575	U	71	338	331
8576	U	13	435	530
8577	U	55	4502	4886
8578	U	28	341	391
8579	U	57	435	452

Table C.26 Raw Data Returned By Laboratory 16 –screening of irradiated samples and blends

SP number	Status	Code number	Lab 16	
			Pot 1	Pot 2
8512	I	47	37832	40453
8513	I	26	12190108	12558760
8514	I	64	4429161	6772705
8515	I	35	52134	44052
8516	I	18	235279	260766
8517	I	5	582754	645251
8518	I	33	479017	336745
8519	I	24	46825	52423
8520	I	69	22546	29499
8521	I	38	33141	30898
8523	I	32	348041	475984
8525	I	8	58070	61115
8526	I	50	25911	22566
8528	I	62	11256910	10990372
8529	I	51	112475	109397
8530	I	21	1312	1862
8531	I	45	319774	500269
8532	I	49	131856	133355
8533	I	15	66531	85899
8534	I	65	14888	14115
8535	I	66	160744	158637
8536	I	44	1375426	1663245
8538	I	16	5383	7453
8539	I	48	31024	34063
8571	I	34	578207	658764
8572	I	41	47035	53367
8573	I	7	3253	2768
8574	I	40	1842047	2015902
8575	I	63	3840	3172
8576	I	52	363010	341079
8577	I	22	133893	181461
8578	I	37	119224	98923
8579	I	43	247390	230868
8531	B	72	28279	20920
8533	B	17	516	691
8535	B	30	816	708
8539	B	36	1659	1969
8577	B	2	62417	62015
8578	B	46	521	463

Table C.27 Raw Data Returned By Laboratory 17 –screening of unirradiated samples

SP number	Status	Code number	Lab 17	
			Pot 1	Pot 2
8512	U	67	456	422
8513	U	31	404	697
8514	U	56	2014	1289
8515	U	42	344	238
8516	U	25	1197	1170
8517	U	58	582	319
8518	U	54	395	355
8519	U	39	325	396
8520	U	68	1275	1361
8521	U	3	407	343
8523	U	12	480	389
8525	U	1	759	492
8526	U	59	573	403
8528	U	10	585	320
8529	U	11	293	547
8530	U	23	336	347
8531	U	29	803	885
8532	U	27	279	757
8533	U	14	334	334
8534	U	4	346	357
8535	U	53	613	651
8536	U	19	1644	1837
8538	U	61	513	356
8539	U	20	381	440
8571	U	9	534	449
8572	U	6	394	357
8573	U	60	309	442
8574	U	70	1707	1152
8575	U	71	324	355
8576	U	13	1086	454
8577	U	55	3062	2901
8578	U	28	591	1196
8579	U	57	457	354

Non-negative results shaded

Table C.28 Raw Data Returned By Laboratory 17 –screening of irradiated samples and blends

SP number	Status	Code number	Lab 17	
			Pot 1	Pot 2
8512	I	47	43101	38425
8513	I	26	14885775	8297428
8514	I	64	11573165	12763174
8515	I	35	18182	20216
8516	I	18	409244	289787
8517	I	5	600805	517517
8518	I	33	278004	318696
8519	I	24	40968	40522
8520	I	69	20615	15170
8521	I	38	30767	29255
8523	I	32	373203	244611
8525	I	8	20178	76299
8526	I	50	21039	19537
8528	I	62	3687049	2238305
8529	I	51	159666	152249
8530	I	21	2264	1894
8531	I	45	314308	241702
8532	I	49	103749	108166
8533	I	15	68709	70954
8534	I	65	12539	9279
8535	I	66	122454	94076
8536	I	44	977140	989948
8538	I	16	3686	8761
8539	I	48	24737	27337
8571	I	34	775803	836543
8572	I	41	27164	25818
8573	I	7	2083	2171
8574	I	40	1222017	1153774
8575	I	63	3418	5340
8576	I	52	336217	307503
8577	I	22	185691	187410
8578	I	37	78928	82772
8579	I	43	136005	108082
8531	B	72	26734	56354
8533	B	17	2115	1024
8535	B	30	556	620
8539	B	36	1655	3153
8577	B	2	17701	11070
8578	B	46	561	521

Table C.29 Raw Data Returned By Laboratory 17 –calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 17	
			Pot 1	Pot 2
8512	U	67	21922	21886
8513	U	31	355723	1037613
8514	U	56	14279475	7673281
8515	U	42	7996	9973
8516	U	25	250528	223736
8517	U	58	258126	293771
8518	U	54	234452	219798
8519	U	39	32830	21612
8520	U	68	10532	7423
8521	U	3	20087	16994
8523	U	12	230725	179810
8525	U	1	21543	22531
8526	U	59	11190	12728
8528	U	10	13741888	14121970
8529	U	11	51858	42678
8530	U	23	1224	1120
8531	U	29	139241	118772
8532	U	27	57114	50246
8533	U	14	42794	39440
8534	U	4	4722	4989
8535	U	53	70962	160183
8536	U	19	818606	843894
8538	U	61	2429	2692
8539	U	20	12634	16200
8571	U	9	96656	110085
8572	U	6	15373	15582
8573	U	60	2465	4077
8574	U	70	690094	710691
8575	U	71	2696	3072
8576	U	13	154812	196081
8577	U	55	443187	490339
8578	U	28	51312	66654
8579	U	57	90770	131240

Table C.30 Raw Data Returned By Laboratory 17 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 17	
			Pot 1	Pot 2
8512	I	47	32591	35645
8513	I	26	14364557	11298692
8514	I	64	3660960	13620196
8515	I	35	18037	22421
8516	I	18	703010	368718
8517	I	5	508825	491621
8518	I	33	349158	314843
8519	I	24	43392	39630
8520	I	69	17130	24037
8521	I	38	30501	41027
8523	I	32	285549	224930
8525	I	8	23133	59476
8526	I	50	20609	21604
8528	I	62	10180002	6041691
8529	I	51	111331	157626
8530	I	21	3659	2068
8531	I	45	251614	201030
8532	I	49	103292	100880
8533	I	15	64306	59023
8534	I	65	9858	8609
8535	I	66	114560	88641
8536	I	44	842700	969748
8538	I	16	4785	4637
8539	I	48	21666	29064
8571	I	34	682208	815835
8572	I	41	23117	22941
8573	I	7	1426	2931
8574	I	40	1018235	1013676
8575	I	63	3025	4684
8576	I	52	324406	317028
8577	I	22	159233	180862
8578	I	37	107418	96582
8579	I	43	118545	100403
8531	B	72	146856	174606
8533	B	17	37008	41469
8535	B	30	65898	139647
8539	B	36	13346	12077
8577	B	2	449981	509025
8578	B	46	78125	43503

Table C.31 Raw Data Returned By Laboratory 18 – screening of unirradiated samples

SP number	Status	Code number	Lab 18	
			Pot 1	Pot 2
8512	U	67	606	648
8513	U	31	3406	5680
8514	U	56	1754	2334
8515	U	42	1057	934
8516	U	25	2073	1041
8517	U	58	900	522
8518	U	54	800	600
8519	U	39	998	770
8520	U	68	742	834
8521	U	3	363	377
8523	U	12	449	450
8525	U	1	763	676
8526	U	59	330	785
8528	U	10	4547	498
8529	U	11	439	408
8530	U	23	1470	564
8531	U	29	6798	4669
8532	U	27	10614	6362
8533	U	14	550	376
8534	U	4	406	463
8535	U	53	1111	1183
8536	U	19	6062	5235
8538	U	61	471	787
8539	U	20	554	638
8571	U	9	480	468
8572	U	6	630	627
8573	U	60	444	330
8574	U	70	1802	2026
8575	U	71	1656	441
8576	U	13	645	691
8577	U	55	5954	6659
8578	U	28	5151	4899
8579	U	57	757	845

Non-negative results shaded

Table C.32 Raw Data Returned By Laboratory 18 –screening of irradiated samples and blends

SP number	Status	Code number	Lab 18	
			Pot 1	Pot 2
8512	I	47	34651	46529
8513	I	26	2556449	11080339
8514	I	64	9644356	1612226
8515	I	35	16772	17139
8516	I	18	614815	434441
8517	I	5	541114	577184
8518	I	33	355128	300246
8519	I	24	44105	78681
8520	I	69	18883	19376
8521	I	38	30554	24573
8523	I	32	336180	386396
8525	I	8	34557	30699
8526	I	50	17269	84973
8528	I	62	15924188	3602589
8529	I	51	163417	95879
8530	I	21	1298	1947
8531	I	45	141332	128409
8532	I	49	99972	110511
8533	I	15	57574	69023
8534	I	65	11333	15834
8535	I	66	123102	128365
8536	I	44	1033955	1153979
8538	I	16	3965	3532
8539	I	48	22874	43711
8571	I	34	797903	732433
8572	I	41	47694	36289
8573	I	7	2169	5270
8574	I	40	496058	1183363
8575	I	63	7105	7396
8576	I	52	307923	266704
8577	I	22	234614	289431
8578	I	37	96189	75055
8579	I	43	311452	442033
8531	B	72	18400	17949
8533	B	17	814	860
8535	B	30	3176	3642
8539	B	36	6920	2672
8577	B	2	8891	7624
8578	B	46	1129	1263

Table C.33 Raw Data Returned By Laboratory 18 –calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 18	
			Pot 1	Pot 2
8512	U	67	30949	34642
8513	U	31	7499685	1953902
8514	U	56	2766261	7730987
8515	U	42	16368	18455
8516	U	25	827848	766659
8517	U	58	309302	421435
8518	U	54	184209	257628
8519	U	39	41760	48480
8520	U	68	11814	18582
8521	U	3	20465	23531
8523	U	12	324630	193046
8525	U	1	30657	20642
8526	U	59	19061	19172
8528	U	10	5572252	15462266
8529	U	11	125778	153102
8530	U	23	3778	5143
8531	U	29	312012	139239
8532	U	27	152351	94043
8533	U	14	51571	48277
8534	U	4	8458	7466
8535	U	53	69545	83882
8536	U	19	764495	651559
8538	U	61	6162	3789
8539	U	20	28266	18319
8571	U	9	115950	119771
8572	U	6	26481	24957
8573	U	60	3603	5565
8574	U	70	809630	841360
8575	U	71	5304	6335
8576	U	13	198513	203921
8577	U	55	561080	573338
8578	U	28	92993	70998
8579	U	57	69862	68238

Table C.34 Raw Data Returned By Laboratory 18 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 18	
			Pot 1	Pot 2
8512	I	47	53309	40590
8513	I	26	2520711	15000999
8514	I	64	8080384	9929371
8515	I	35	50446	40241
8516	I	18	11224436	1107243
8517	I	5	479267	530441
8518	I	33	402348	338781
8519	I	24	72426	53176
8520	I	69	63653	15846
8521	I	38	41827	48583
8523	I	32	499723	486317
8525	I	8	50406	82007
8526	I	50	22360	22223
8528	I	62	1231703	1412590
8529	I	51	88313	108259
8530	I	21	3763	35677
8531	I	45	236673	267181
8532	I	49	81887	95789
8533	I	15	65932	69839
8534	I	65	35145	33306
8535	I	66	216240	135457
8536	I	44	988980	1114127
8538	I	16	14540	18063
8539	I	48	34803	43978
8571	I	34	862857	1023492
8572	I	41	41386	55128
8573	I	7	53336	23223
8574	I	40	1385570	1466601
8575	I	63	54361	15287
8576	I	52	430079	288509
8577	I	22	201699	226910
8578	I	37	97082	108374
8579	I	43	135001	114013
8531	B	72	148885	116898
8533	B	17	44560	604150
8535	B	30	127813	96466
8539	B	36	48809	46300
8577	B	2	519170	513987
8578	B	46	66130	56621

Table C.35 Raw Data Returned By Laboratory 19 – screening of unirradiated samples

SP number	Status	Code number	Lab 19	
			Pot 1	Pot 2
8512	U	67	308	241
8513	U	31	619	393
8514	U	56	1465	1390
8515	U	42	435	293
8516	U	25	870	1342
8517	U	58	584	391
8518	U	54	448	430
8519	U	39	366	358
8520	U	68	500	446
8521	U	3	394	345
8523	U	12	427	275
8525	U	1	1560	1449
8526	U	59	442	337
8528	U	10	340	414
8529	U	11	1310	559
8530	U	23	292	311
8531	U	29	4247	997
8532	U	27	307	432
8533	U	14	283	281
8534	U	4	378	368
8535	U	53	727	816
8536	U	19	10909	3723
8538	U	61	433	443
8539	U	20	407	516
8571	U	9	479	516
8572	U	6	584	546
8573	U	60	262	350
8574	U	70	1880	1853
8575	U	71	317	301
8576	U	13	702	867
8577	U	55	4762	5029
8578	U	28	577	695
8579	U	57	450	474

Non-negative results shaded

Table C.36 Raw Data Returned By Laboratory 19 –screening of irradiated samples and blends

SP number	Status	Code number	Lab 19	
			Pot 1	Pot 2
8512	I	47	52539	37709
8513	I	26	16637143	17226362
8514	I	64	19647258	21815714
8515	I	35	29840	38275
8516	I	18	284797	284714
8517	I	5	694776	558473
8518	I	33	369839	433608
8519	I	24	70660	55980
8520	I	69	27975	21677
8521	I	38	32985	32117
8523	I	32	484311	435721
8525	I	8	53286	25129
8526	I	50	27766	23141
8528	I	62	11022426	13586093
8529	I	51	153515	69011
8530	I	21	3476	1804
8531	I	45	269072	281963
8532	I	49	116150	138858
8533	I	15	80793	69270
8534	I	65	12308	9988
8535	I	66	222613	161575
8536	I	44	1228023	1000500
8538	I	16	3544	7224
8539	I	48	49876	26336
8571	I	34	1134014	1145009
8572	I	41	55597	41331
8573	I	7	4692	2284
8574	I	40	1592395	1313447
8575	I	63	7287	5503
8576	I	52	347521	378101
8577	I	22	223357	224667
8578	I	37	191809	74759
8579	I	43	247137	138215
8531	B	72	51400	37287
8533	B	17	852	1544
8535	B	30	488	1069
8539	B	36	2604	1821
8577	B	2	15779	15935
8578	B	46	667	533

Table C.37 Raw Data Returned By Laboratory 19 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 19	
			Pot 1	Pot 2
8512	U	67	29910	20067
8513	U	31	6631594	5535342
8514	U	56	9992404	8408140
8515	U	42	16608	9045
8516	U	25	123928	131153
8517	U	58	256487	210764
8518	U	54	183336	241370
8519	U	39	19704	18714
8520	U	68	16210	6189
8521	U	3	16747	20614
8523	U	12	217303	195918
8525	U	1	51295	18440
8526	U	59	37325	8121
8528	U	10	7040103	6075185
8529	U	11	74783	81973
8530	U	23	922	957
8531	U	29	1097759	217329
8532	U	27	49780	45589
8533	U	14	41107	30378
8534	U	4	5476	5150
8535	U	53	71974	63919
8536	U	19	898811	599040
8538	U	61	3037	2542
8539	U	20	14254	12957
8571	U	9	91521	64153
8572	U	6	11944	18854
8573	U	60	1371	2071
8574	U	70	589556	719899
8575	U	71	3637	3555
8576	U	13	240896	174644
8577	U	55	555057	496069
8578	U	28	65733	68470
8579	U	57	53635	76942

Table C.38 Raw Data Returned By Laboratory 19 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 19	
			Pot 1	Pot 2
8512	I	47	33331	35588
8513	I	26	13702222	10956695
8514	I	64	6012367	5257530
8515	I	35	15496	15039
8516	I	18	273258	254668
8517	I	5	367894	312092
8518	I	33	249887	186239
8519	I	24	46078	63232
8520	I	69	12498	24975
8521	I	38	22054	17798
8523	I	32	203170	170348
8525	I	8	18899	27940
8526	I	50	14846	21037
8528	I	62	10096556	10514290
8529	I	51	60112	104768
8530	I	21	2101	1428
8531	I	45	304807	225705
8532	I	49	90340	88443
8533	I	15	49569	47809
8534	I	65	9176	10762
8535	I	66	268069	97307
8536	I	44	832417	1500341
8538	I	16	4808	9056
8539	I	48	15216	17996
8571	I	34	946070	592174
8572	I	41	25732	37775
8573	I	7	3821	12065
8574	I	40	1308998	1107425
8575	I	63	10594	5306
8576	I	52	289368	266744
8577	I	22	176204	126784
8578	I	37	75248	94695
8579	I	43	110847	84905
8531	B	72	166594	109436
8533	B	17	34767	34968
8535	B	30	71564	74025
8539	B	36	12577	6352
8577	B	2	535661	514532
8578	B	46	92645	77801

Table C.39 Raw Data Returned By Laboratory 20 – screening of unirradiated samples

SP number	Status	Code number	Lab 20	
			Pot 1	Pot 2
8512	U	67	401	343
8513	U	31	452	386
8514	U	56	2210	1549
8515	U	42	330	329
8516	U	25	864	937
8517	U	58	523	560
8518	U	54	322	396
8519	U	39	273	286
8520	U	68	361	406
8521	U	3	243	293
8523	U	12	327	322
8525	U	1	599	663
8526	U	59	446	313
8528	U	10	452	367
8529	U	11	388	395
8530	U	23	294	213
8531	U	29	513	391
8532	U	27	401	488
8533	U	14	368	428
8534	U	4	280	274
8535	U	53	457	381
8536	U	19	6352	6125
8538	U	61	323	300
8539	U	20	340	387
8571	U	9	340	339
8572	U	6	334	381
8573	U	60	294	355
8574	U	70	1291	1500
8575	U	71	319	269
8576	U	13	467	487
8577	U	55	3126	2835
8578	U	28	329	336
8579	U	57	283	346

Non-negative results shaded

Table C.40 Raw Data Returned By Laboratory 20 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 20	
			Pot 1	Pot 2
8512	I	47	33452	35478
8513	I	26	14858885	15377677
8514	I	64	11980728	10253402
8515	I	35	9739	8967
8516	I	18	237260	220833
8517	I	5	437423	473200
8518	I	33	239935	221992
8519	I	24	31968	34153
8520	I	69	10768	15284
8521	I	38	21979	16758
8523	I	32	255761	226620
8525	I	8	35856	27433
8526	I	50	31661	33866
8528	I	62	11584632	11834355
8529	I	51	65011	72857
8530	I	21	943	884
8531	I	45	223537	214373
8532	I	49	70452	76525
8533	I	15	56582	58526
8534	I	65	8788	7507
8535	I	66	122532	122175
8536	I	44	999716	1120749
8538	I	16	3255	3778
8539	I	48	18450	17116
8571	I	34	690187	740668
8572	I	41	38781	36009
8573	I	7	3269	3448
8574	I	40	1228297	1306115
8575	I	63	3146	3126
8576	I	52	216786	237672
8577	I	22	174435	154015
8578	I	37	73684	65787
8579	I	43	131867	118807
8531	B	72	10967	11406
8533	B	17	551	660
8535	B	30	681	573
8539	B	36	899	935
8577	B	2	8454	6161
8578	B	46	470	492

Table C.41 Raw Data Returned By Laboratory 21 – screening of unirradiated samples

SP number	Status	Code number	Lab 21	
			Pot 1	Pot 2
8512	U	67	249	394
8513	U	31	254	155
8514	U	56	1121	1164
8515	U	42	247	236
8516	U	25	1574	1188
8517	U	58	451	1230
8518	U	54	376	333
8519	U	39	255	192
8520	U	68	344	625
8521	U	3	291	388
8523	U	12	288	444
8525	U	1	362	831
8526	U	59	238	158
8528	U	10	374	304
8529	U	11	346	555
8530	U	23	172	446
8531	U	29	1816	566
8532	U	27	329	389
8533	U	14	359	155
8534	U	4	259	275
8535	U	53	467	663
8536	U	19	2316	1975
8538	U	61	352	223
8539	U	20	402	275
8571	U	9	387	510
8572	U	6	299	262
8573	U	60	365	193
8574	U	70	1561	1420
8575	U	71	359	202
8576	U	13	574	720
8577	U	55	2905	4744
8578	U	28	335	561
8579	U	57	412	322

Non-negative results shaded

Table C.42 Raw Data Returned By Laboratory 21 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 21	
			Pot 1	Pot 2
8512	I	47	30450	28338
8513	I	26	4908542	12208098
8514	I	64	8032934	3895753
8515	I	35	15186	10408
8516	I	18	663722	642956
8517	I	5	346549	437913
8518	I	33	353983	378227
8519	I	24	36107	53234
8520	I	69	21916	17856
8521	I	38	24478	27500
8523	I	32	328564	293756
8525	I	8	31118	30553
8526	I	50	14653	9666
8528	I	62	14120491	11980180
8529	I	51	81957	98700
8530	I	21	1640	815
8531	I	45	232648	345110
8532	I	49	94843	108897
8533	I	15	53871	83420
8534	I	65	10113	8233
8535	I	66	105484	120737
8536	I	44	445418	758151
8538	I	16	2828	3467
8539	I	48	34026	26960
8571	I	34	675978	715956
8572	I	41	28907	31315
8573	I	7	3459	2898
8574	I	40	1131817	1061134
8575	I	63	5688	4801
8576	I	52	272157	180950
8577	I	22	133891	158767
8578	I	37	75450	85802
8579	I	43	151155	223303
8531	B	72	21392	24240
8533	B	17	801	~~675~~
8535	B	30	639	664
8539	B	36	1486	1691
8577	B	2	9081	15508
8578	B	46	421	406

Table C.43 Raw Data Returned By Laboratory 22 – screening of unirradiated samples

SP number	Status	Code number	Lab 22	
			Pot 1	Pot 2
8512	U	67	675	13024
8513	U	31	321	794
8514	U	56	723	1035
8515	U	42	435	1169
8516	U	25	650	1174
8517	U	58	402	536
8518	U	54	345	388
8519	U	39	298	506
8520	U	68	1380	2493
8521	U	3	249	199
8523	U	12	285	319
8525	U	1	938	2261
8526	U	59	2144	346
8528	U	10	473	403
8529	U	11	354	368
8530	U	23	282	235
8531	U	29	3283	4704
8532	U	27	10258	10888
8533	U	14	297	304
8534	U	4	234	324
8535	U	53	645	777
8536	U	19	1345	3772
8538	U	61	282	555
8539	U	20	318	244
8571	U	9	418	296
8572	U	6	265	343
8573	U	60	366	166
8574	U	70	3458	1668
8575	U	71	419	324
8576	U	13	398	381
8577	U	55	2795	8135
8578	U	28	1508	3037
8579	U	57	932	273

Non-negative results shaded

Table C.44 Raw Data Returned By Laboratory 22 – screening of for irradiated samples and blends

SP number	Status	Code number	Lab 22	
			Pot 1	Pot 2
8512	I	47	33926	20086
8513	I	26	175500	3432284
8514	I	64	11215921	8620105
8515	I	35	9678	26023
8516	I	18	170810	282709
8517	I	5	353685	319248
8518	I	33	201582	206797
8519	I	24	28666	28581
8520	I	69	13319	21781
8521	I	38	19051	27895
8523	I	32	253076	205132
8525	I	8	28411	17715
8526	I	50	38824	23461
8528	I	62	1896464	4357782
8529	I	51	78621	91919
8530	I	21	2116	1269
8531	I	45	204294	234938
8532	I	49	84275	71122
8533	I	15	57089	59818
8534	I	65	23167	15118
8535	I	66	114687	134509
8536	I	44	707049	527493
8538	I	16	4432	4114
8539	I	48	21420	23216
8571	I	34	614400	607210
8572	I	41	27308	32317
8573	I	7	1740	6877
8574	I	40	903721	784854
8575	I	63	11770	4572
8576	I	52	223658	231192
8577	I	22	163068	112965
8578	I	37	61532	84639
8579	I	43	91713	104471
8531	B	72	38620	15526
8533	B	17	503	767
8535	B	30	1405	4110
8539	B	36	1887	1559
8577	B	2	4807	8295
8578	B	46	472	531

Table C.45 Raw Data Returned By Laboratory 23 – screening of unirradiated samples

SP number	Status	Code number	Lab 23	
			Pot 1	Pot 2
8512	U	67	519	379
8513	U	31	463	718
8514	U	56	1526	2330
8515	U	42	423	431
8516	U	25	962	950
8517	U	58	755	514
8518	U	54	701	455
8519	U	39	747	392
8520	U	68	561	547
8521	U	3	373	306
8523	U	12	410	376
8525	U	1	776	574
8526	U	59	324	432
8528	U	10	393	374
8529	U	11	469	453
8530	U	23	291	322
8531	U	29	949	1182
8532	U	27	448	429
8533	U	14	243	338
8534	U	4	353	437
8535	U	53	1076	3164
8536	U	19	2377	3129
8538	U	61	399	451
8539	U	20	450	334
8571	U	9	520	499
8572	U	6	419	555
8573	U	60	390	410
8574	U	70	1899	3537
8575	U	71	30006	23013
8576	U	13	519	527
8577	U	55	6726	4301
8578	U	28	612	560
8579	U	57	427	345

Non-negative results shaded

Table C.46 Raw Data Returned By Laboratory 23 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 23	
			Pot 1	Pot 2
8512	I	47	45246	37063
8513	I	26	15896915	10211898
8514	I	64	4588391	3786666
8515	I	35	25275	17774
8516	I	18	257610	221475
8517	I	5	557752	655278
8518	I	33	481186	462532
8519	I	24	48345	58470
8520	I	69	32739	161977
8521	I	38	50165	23591
8523	I	32	505684	411124
8525	I	8	42012	188388
8526	I	50	36498	28250
8528	I	62	12205124	11717020
8529	I	51	111113	157203
8530	I	21	2099	1599
8531	I	45	281605	554185
8532	I	49	117186	125239
8533	I	15	77956	73484
8534	I	65	46254	10930
8535	I	66	154340	155002
8536	I	44	1506284	1128405
8538	I	16	3978	6675
8539	I	48	26863	27758
8571	I	34	936202	1058850
8572	I	41	53316	41328
8573	I	7	3212	4559
8574	I	40	1824842	1641073
8575	I	63	5945	6000
8576	I	52	406881	401368
8577	I	22	240863	245679
8578	I	37	181815	105907
8579	I	43	208448	174872
8531	B	72	545	382
8533	B	17	1438	2379
8535	B	30	1706	996
8539	B	36	1933	2578
8577	B	2	12254	11356
8578	B	46	495	528

Table C.47 Raw Data Returned By Laboratory 23 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 23	
			Pot 1	Pot 2
8512	U	67	27126	30702
8513	U	31	12843016	11370888
8514	U	56	11310263	13722745
8515	U	42	27518	13978
8516	U	25	227545	182518
8517	U	58	384708	375937
8518	U	54	324582	375462
8519	U	39	35896	42675
8520	U	68	11790	18583
8521	U	3	32173	39145
8523	U	12	235602	298993
8525	U	1	19730	30394
8526	U	59	18221	19675
8528	U	10	8898895	8207120
8529	U	11	78299	88134
8530	U	23	2545	3770
8531	U	29	151393	194283
8532	U	27	97669	94046
8533	U	14	77856	79257
8534	U	4	13468	16453
8535	U	53	130416	177003
8536	U	19	787179	722801
8538	U	61	10955	4272
8539	U	20	21746	29762
8571	U	9	218646	121024
8572	U	6	38890	36596
8573	U	60	5220	3230
8574	U	70	1250682	1336745
8575	U	71	171240	164152
8576	U	13	232214	276429
8577	U	55	804372	699137
8578	U	28	72516	59597
8579	U	57	103985	122123

Table C.48 Raw Data Returned By Laboratory 23 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 23	
			Pot 1	Pot 2
8512	I	47	504421	58521
8513	I	26	27017713	25182247
8514	I	64	30236335	25610617
8515	I	35	18761	31518
8516	I	18	424749	479657
8517	I	5	604036	580568
8518	I	33	492562	520034
8519	I	24	132360	45453
8520	I	69	31401	101567
8521	I	38	47971	52836
8523	I	32	649531	587723
8525	I	8	35339	50470
8526	I	50	23419	22656
8528	I	62	20302293	19018463
8529	I	51	108602	106855
8530	I	21	2674	3369
8531	I	45	324485	261227
8532	I	49	124995	130054
8533	I	15	72620	84671
8534	I	65	17547	16753
8535	I	66	251896	321500
8536	I	44	903064	1723331
8538	I	16	8657	6510
8539	I	48	33254	30441
8571	I	34	1079961	1102512
8572	I	41	58928	51631
8573	I	7	3755	4770
8574	I	40	1985661	2278841
8575	I	63	8751	10166
8576	I	52	306748	288243
8577	I	22	212946	211089
8578	I	37	95855	129065
8579	I	43	162973	218089
8531	B	72	5489	3325
8533	B	17	50186	61315
8535	B	30	131323	136991
8539	B	36	25605	28374
8577	B	2	804184	709120
8578	B	46	65388	71690

Table C.49 Raw Data Returned By Laboratory 24 – screening of unirradiated samples

SP number	Status	Code number	Lab 24	
			Pot 1	Pot 2
8512	U	67	889	295
8513	U	31	321	647
8514	U	56	2001	3197
8515	U	42	356	262
8516	U	25	1563	999
8517	U	58	595	584
8518	U	54	433	402
8519	U	39	307	308
8520	U	68	452	442
8521	U	3	271	284
8523	U	12	371	360
8525	U	1	472	555
8526	U	59	409	498
8528	U	10	467	408
8529	U	11	508	387
8530	U	23	264	181
8531	U	29	486	760
8532	U	27	458	1257
8533	U	14	353	279
8534	U	4	337	275
8535	U	53	1216	922
8536	U	19	4144	7877
8538	U	61	563	440
8539	U	20	304	345
8571	U	9	71742	80906
8572	U	6	411	448
8573	U	60	361	351
8574	U	70	2212	3491
8575	U	71	239	378
8576	U	13	552	621
8577	U	55	7781	5009
8578	U	28	519	440
8579	U	57	371	433

Table C.50 Raw Data Returned By Laboratory 24 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 24	
			Pot 1	Pot 2
8512	I	47	68073	57082
8513	I	26	13188717	14036104
8514	I	64	6029965	4281496
8515	I	35	16111	12053
8516	I	18	267268	253218
8517	I	5	420056	559096
8518	I	33	347250	430311
8519	I	24	42122	56764
8520	I	69	22019	20094
8521	I	38	26129	26618
8523	I	32	434720	572184
8525	I	8	31213	61576
8526	I	50	29379	34955
8528	I	62	3163677	4909169
8529	I	51	152932	278455
8530	I	21	2751	1667
8531	I	45	477079	779454
8532	I	49	154759	177001
8533	I	15	83581	78880
8534	I	65	15188	15973
8535	I	66	204070	199679
8536	I	44	1951431	1805891
8538	I	16	9474	14847
8539	I	48	50254	62748
8571	I	34	843559	906310
8572	I	41	72996	85907
8573	I	7	8981	8610
8574	I	40	2094402	2328608
8575	I	63	12552	7546
8576	I	52	464995	518246
8577	I	22	202436	270595
8578	I	37	103837	113930
8579	I	43	226762	182473
8531	B	72	58172	70512
8533	B	17	2309	1034
8535	B	30	1210	849
8539	B	36	3285	2672
8577	B	2	20234	34121
8578	B	46	798	780

Table C.51 Raw Data Returned By Laboratory 24 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 24	
			Pot 1	Pot 2
8512	U	67	28072	29786
8513	U	31	7215163	7322224
8514	U	56	3300452	15224325
8515	U	42	11294	12144
8516	U	25	419918	222887
8517	U	58	338561	331646
8518	U	54	180908	237446
8519	U	39	60163	37850
8520	U	68	8489	18507
8521	U	3	28153	26921
8523	U	12	168843	198062
8525	U	1	23264	19699
8526	U	59	14232	20890
8528	U	10	6701364	5934251
8529	U	11	58782	56797
8530	U	23	730	1881
8531	U	29	184594	172743
8532	U	27	56592	60078
8533	U	14	27131	34118
8534	U	4	6155	6689
8535	U	53	111238	78712
8536	U	19	988672	810026
8538	U	61	2447	2393
8539	U	20	17905	28610
8571	U	9	55868	54423
8572	U	6	23451	21197
8573	U	60	2788	2278
8574	U	70	992615	844343
8575	U	71	3130	2923
8576	U	13	292025	233056
8577	U	55	625338	701776
8578	U	28	59992	66165
8579	U	57	108282	189162

Table C.52 Raw Data Returned By Laboratory 24 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 24	
			Pot 1	Pot 2
8512	I	47	53105	42231
8513	I	26	15070049	16120632
8514	I	64	2136081	16201835
8515	I	35	23149	17031
8516	I	18	503773	424515
8517	I	5	335117	376897
8518	I	33	420331	400253
8519	I	24	73899	43259
8520	I	69	22872	31494
8521	I	38	29386	30361
8523	I	32	387850	374088
8525	I	8	45811	36817
8526	I	50	23850	19137
8528	I	62	3679937	1488252
8529	I	51	103851	92981
8530	I	21	2867	1265
8531	I	45	256626	455275
8532	I	49	98842	99641
8533	I	15	48685	64334
8534	I	65	9554	10203
8535	I	66	173397	144224
8536	I	44	1159459	974808
8538	I	16	5349	2175
8539	I	48	36361	36438
8571	I	34	1084074	897816
8572	I	41	42478	50558
8573	I	7	3942	5174
8574	I	40	1631181	1404564
8575	I	63	8764	7794
8576	I	52	373326	406720
8577	I	22	152163	238487
8578	I	37	113047	133386
8579	I	43	94092	239583
8531	B	72	143690	303328
8533	B	17	35147	36846
8535	B	30	79547	65724
8539	B	36	15141	10599
8577	B	2	788876	725733
8578	B	46	92927	111189

Table C.53 Raw Data Returned By Laboratory 25 – screening of unirradiated samples

SP number	Status	Code number	Lab 25	
			Pot 1	Pot 2
8512	U	67	200	267
8513	U	31	376	498
8514	U	56	1650	3975
8515	U	42	388	294
8516	U	25	1034	2424
8517	U	58	547	502
8518	U	54	335	453
8519	U	39	346	299
8520	U	68	427	316
8521	U	3	320	254
8523	U	12	345	383
8525	U	1	486	519
8526	U	59	488	259
8528	U	10	416	303
8529	U	11	295	452
8530	U	23	307	346
8531	U	29	533	648
8532	U	27	418	455
8533	U	14	351	299
8534	U	4	321	332
8535	U	53	633	698
8536	U	19	4467	4338
8538	U	61	364	331
8539	U	20	274	483
8571	U	9	461	530
8572	U	6	365	434
8573	U	60	358	339
8574	U	70	2064	1743
8575	U	71	383	418
8576	U	13	424	464
8577	U	55	4056	3089
8578	U	28	543	435
8579	U	57	344	384

Non-negative results shaded

Table C.54 Raw Data Returned By Laboratory 25 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 25	
			Pot 1	Pot 2
8512	I	47	29214	36917
8513	I	26	14653081	16094050
8514	I	64	1916374	9972190
8515	I	35	13495	13672
8516	I	18	245643	235948
8517	I	5	542001	393641
8518	I	33	378162	194684
8519	I	24	34252	32276
8520	I	69	26156	11492
8521	I	38	21430	22150
8523	I	32	306643	356629
8525	I	8	28998	24835
8526	I	50	42238	13722
8528	I	62	14782595	14257131
8529	I	51	124675	272642
8530	I	21	2292	2713
8531	I	45	426703	257506
8532	I	49	116332	150228
8533	I	15	64815	68459
8534	I	65	6667	8754
8535	I	66	122774	150600
8536	I	44	1058034	1199078
8538	I	16	3270	2918
8539	I	48	44393	18191
8571	I	34	831817	762982
8572	I	41	32813	32961
8573	I	7	3070	2902
8574	I	40	1466454	1357369
8575	I	63	4586	3394
8576	I	52	268313	235802
8577	I	22	221093	166053
8578	I	37	184267	131590
8579	I	43	115655	283417
8531	B	72	47173	39754
8533	B	17	861	706
8535	B	30	1382	937
8539	B	36	1961	2219
8577	B	2	9462	10068
8578	B	46	359	518

Table C.55 Raw Data Returned By Laboratory 25 –calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 25	
			Pot 1	Pot 2
8512	U	67	20722	19467
8513	U	31	4949295	15483075
8514	U	56	1561909	6885856
8515	U	42	10262	46242
8516	U	25	216214	310170
8517	U	58	250737	299545
8518	U	54	219527	247300
8519	U	39	33393	22196
8520	U	68	9120	30445
8521	U	3	20363	24259
8523	U	12	280020	233123
8525	U	1	21319	15307
8526	U	59	11863	12818
8528	U	10	2765768	15303573
8529	U	11	166965	57115
8530	U	23	1925	1129
8531	U	29	132154	144437
8532	U	27	62912	52774
8533	U	14	39799	42736
8534	U	4	8506	7720
8535	U	53	81897	74912
8536	U	19	818134	897340
8538	U	61	31581	21682
8539	U	20	14893	23452
8571	U	9	114067	130362
8572	U	6	32710	27749
8573	U	60	2731	3133
8574	U	70	962765	943902
8575	U	71	2686	3995
8576	U	13	172218	153058
8577	U	55	488270	509935
8578	U	28	44827	52558
8579	U	57	78604	88978

Table C.56 Raw Data Returned By Laboratory 25 –calibrated PSL for irradiated samples

SP number	Status	Code number	Lab 25	
			Pot 1	Pot 2
8512	I	47	30193	30498
8513	I	26	1108494	13503502
8514	I	64	1838472	2257048
8515	I	35	15776	20003
8516	I	18	1010070	641343
8517	I	5	487732	513865
8518	I	33	322461	243261
8519	I	24	48468	86335
8520	I	69	24894	24949
8521	I	38	22181	29020
8523	I	32	254489	247665
8525	I	8	32982	30871
8526	I	50	30262	23250
8528	I	62	14607130	12687175
8529	I	51	132348	141299
8530	I	21	2000	2381
8531	I	45	310014	187733
8532	I	49	115090	96452
8533	I	15	60087	66517
8534	I	65	9170	11202
8535	I	66	142478	143540
8536	I	44	1282496	1478708
8538	I	16	9669	7520
8539	I	48	33377	26874
8571	I	34	752683	828586
8572	I	41	19319	32076
8573	I	7	4113	3127
8574	I	40	1409525	1365439
8575	I	63	18467	10513
8576	I	52	249669	324279
8577	I	22	176398	129438
8578	I	37	81046	119961
8579	I	43	146900	444267
8531	B	72	158914	203422
8533	B	17	43588	37107
8535	B	30	86856	68608
8539	B	36	15337	42143
8577	B	2	421424	458753
8578	B	46	74752	46971

Table C.57 Raw Data Returned By Laboratory 26 – screening of unirradiated samples

SP number	Status	Code number	Lab 26	
			Pot 1	Pot 2
8512	U	67	299	333
8513	U	31	376	280
8514	U	56	1580	1022
8515	U	42	357	348
8516	U	25	2116	1435
8517	U	58	599	369
8518	U	54	566	440
8519	U	39	263	283
8520	U	68	297	468
8521	U	3	289	248
8523	U	12	609	484
8525	U	1	548	385
8526	U	59	462	301
8528	U	10	404	382
8529	U	11	368	399
8530	U	23	274	310
8531	U	29	661	498
8532	U	27	2084	1000
8533	U	14	504	238
8534	U	4	278	376
8535	U	53	600	658
8536	U	19	2734	1338
8538	U	61	305	418
8539	U	20	372	358
8571	U	9	401	458
8572	U	6	329	511
8573	U	60	677	528
8574	U	70	1559	4477
8575	U	71	247	367
8576	U	13	358	414
8577	U	55	2734	3075
8578	U	28	484	589
8579	U	57	393	323

Non-negative results shaded

Table C.58 Raw Data Returned By Laboratory 26 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 26	
			Pot 1	Pot 2
8512	I	47	25419	23414
8513	I	26	16559751	559458
8514	I	64	7192896	14047800
8515	I	35	55476	10228
8516	I	18	670984	869742
8517	I	5	345413	352157
8518	I	33	252406	229573
8519	I	24	32061	32190
8520	I	69	24041	11203
8521	I	38	22909	23079
8523	I	32	313808	167297
8525	I	8	27924	27976
8526	I	50	12125	11619
8528	I	62	6429549	12062249
8529	I	51	55725	62914
8530	I	21	1251	2017
8531	I	45	173274	208672
8532	I	49	64915	115261
8533	I	15	49224	45715
8534	I	65	8526	5515
8535	I	66	109885	79495
8536	I	44	866877	599006
8538	I	16	4360	4751
8539	I	48	25083	22986
8571	I	34	548036	682493
8572	I	41	30514	22423
8573	I	7	2246	2199
8574	I	40	793854	1024138
8575	I	63	2394	2682
8576	I	52	209878	183694
8577	I	22	176795	151985
8578	I	37	54087	56220
8579	I	43	62883	83922
8531	B	72	18219	14555
8533	B	17	1953	1127
8535	B	30	579	527
8539	B	36	1149	1188
8577	B	2	8149	13203
8578	B	46	587	332

Table C.59 Raw Data Returned By Laboratory 26 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 26	
			Pot 1	Pot 2
8512	U	67	15310	21613
8513	U	31	2129713	16378840
8514	U	56	7768798	1600473
8515	U	42	6521	5133
8516	U	25	266702	314550
8517	U	58	234983	206775
8518	U	54	189129	54597
8519	U	39	24156	17205
8520	U	68	5869	7831
8521	U	3	31953	18983
8523	U	12	127250	165050
8525	U	1	14327	12180
8526	U	59	32538	33714
8528	U	10	7433412	13388576
8529	U	11	49926	59052
8530	U	23	1179	1386
8531	U	29	127828	137471
8532	U	27	64647	74173
8533	U	14	35994	33338
8534	U	4	8322	4930
8535	U	53	51645	138912
8536	U	19	807699	562688
8538	U	61	4117	3955
8539	U	20	10241	11359
8571	U	9	79796	96872
8572	U	6	18811	19654
8573	U	60	4973	1546
8574	U	70	714857	642996
8575	U	71	2858	2070
8576	U	13	142537	143351
8577	U	55	364815	321459
8578	U	28	45394	38528
8579	U	57	45989	198385

Table C.60 Raw Data Returned By Laboratory 26 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 26	
			Pot 1	Pot 2
8512	I	47	31854	22213
8513	I	26	4390921	12317747
8514	I	64	9127918	16348653
8515	I	35	44587	11409
8516	I	18	543342	667190
8517	I	5	418990	314295
8518	I	33	206819	250137
8519	I	24	43126	30881
8520	I	69	20383	13495
8521	I	38	24793	40103
8523	I	32	278812	138647
8525	I	8	16262	39742
8526	I	50	24230	12410
8528	I	62	14703655	9232486
8529	I	51	77897	71235
8530	I	21	1623	2149
8531	I	45	155144	247579
8532	I	49	61320	65505
8533	I	15	55912	55872
8534	I	65	10639	9642
8535	I	66	174029	147468
8536	I	44	975020	666993
8538	I	16	4349	9652
8539	I	48	22737	24318
8571	I	34	573623	606758
8572	I	41	29138	25545
8573	I	7	7587	1989
8574	I	40	784677	1090956
8575	I	63	6277	3895
8576	I	52	190257	290478
8577	I	22	155336	129428
8578	I	37	73647	80672
8579	I	43	88303	51407
8531	B	72	1747980	86628
8533	B	17	30876	30276
8535	B	30	76750	64145
8539	B	36	9850	12807
8577	B	2	374151	361286
8578	B	46	53382	36909

Table C.61 Raw Data Returned By Laboratory 27 – screening of unirradiated samples

SP number	Status	Code number	Lab 27	
			Pot 1	Pot 2
8512	U	67	330	267
8513	U	31	272	546
8514	U	56	880	821
8515	U	42	239	293
8516	U	25	625	598
8517	U	58	324	297
8518	U	54	267	287
8519	U	39	333	217
8520	U	68	306	344
8521	U	3	350	329
8523	U	12	319	309
8525	U	1	327	443
8526	U	59	258	171
8528	U	10	291	412
8529	U	11	344	376
8530	U	23	341	264
8531	U	29	501	346
8532	U	27	1371	1285
8533	U	14	250	348
8534	U	4	182	300
8535	U	53	609	393
8536	U	19	1468	1629
8538	U	61	345	359
8539	U	20	335	406
8571	U	9	395	363
8572	U	6	322	426
8573	U	60	225	204
8574	U	70	963	713
8575	U	71	392	296
8576	U	13	339	406
8577	U	55	2393	1873
8578	U	28	447	425
8579	U	57	268	288

Non-negative results shaded

Table C.62 Raw Data Returned By Laboratory 27 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 27	
			Pot 1	Pot 2
8512	I	47	17748	21353
8513	I	26	9781532	12446254
8514	I	64	14178201	12438359
8515	I	35	5376	6982
8516	I	18	162206	180251
8517	I	5	323287	290101
8518	I	33	169886	168575
8519	I	24	17595	17982
8520	I	69	19973	10475
8521	I	38	13313	13224
8523	I	32	139971	207579
8525	I	8	93256	34780
8526	I	50	10275	14904
8528	I	62	7033536	10726789
8529	I	51	49435	32341
8530	I	21	1549	871
8531	I	45	168518	147755
8532	I	49	49121	47231
8533	I	15	28033	32120
8534	I	65	3735	4515
8535	I	66	54807	59590
8536	I	44	341192	445812
8538	I	16	2635	2011
8539	I	48	26832	12517
8571	I	34	330842	360796
8572	I	41	14158	15521
8573	I	7	2900	2006
8574	I	40	598362	848532
8575	I	63	1992	3877
8576	I	52	124406	133610
8577	I	22	107184	151422
8578	I	37	42183	44700
8579	I	43	51499	80283
8531	B	72	10832	10473
8533	B	17	569	303
8535	B	30	729	726
8539	B	36	1467	1261
8577	B	2	4487	4680
8578	B	46	443	388

Table C.63 Raw Data Returned By Laboratory 27 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 27	
			Pot 1	Pot 2
8512	U	67	11600	9067
8513	U	31	16000206	15730733
8514	U	56	5627783	9432607
8515	U	42	4232	4900
8516	U	25	376925	403688
8517	U	58	134257	119890
8518	U	54	99347	108499
8519	U	39	17116	16398
8520	U	68	4299	4764
8521	U	3	9814	12021
8523	U	12	73494	97374
8525	U	1	8216	13853
8526	U	59	6649	5674
8528	U	10	14646318	14737471
8529	U	11	44203	25408
8530	U	23	1232	671
8531	U	29	68540	72863
8532	U	27	30822	23222
8533	U	14	18461	17718
8534	U	4	3297	3085
8535	U	53	36321	32635
8536	U	19	386610	343622
8538	U	61	3574	7439
8539	U	20	25319	7594
8571	U	9	69007	40059
8572	U	6	11023	9545
8573	U	60	1563	1329
8574	U	70	385299	373003
8575	U	71	1332	1826
8576	U	13	77212	76844
8577	U	55	209376	227951
8578	U	28	30095	29954
8579	U	57	43222	37506

Table C.64 Raw Data Returned By Laboratory 27 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 27	
			Pot 1	Pot 2
8512	I	47	18592	13374
8513	I	26	10267835	11961542
8514	I	64	4697571	9058260
8515	I	35	7892	9850
8516	I	18	911440	417701
8517	I	5	208407	283216
8518	I	33	162248	177075
8519	I	24	33444	24919
8520	I	69	14039	5926
8521	I	38	15334	12735
8523	I	32	134858	262085
8525	I	8	22992	8493
8526	I	50	10250	10817
8528	I	62	12147665	10603278
8529	I	51	62001	36012
8530	I	21	2452	5958
8531	I	45	127917	152187
8532	I	49	46667	36620
8533	I	15	25478	27767
8534	I	65	7435	9605
8535	I	66	52416	87467
8536	I	44	481115	336968
8538	I	16	4478	3327
8539	I	48	19280	17527
8571	I	34	419362	372177
8572	I	41	15399	19795
8573	I	7	2233	1432
8574	I	40	792196	629634
8575	I	63	3280	1856
8576	I	52	106570	106426
8577	I	22	81070	104830
8578	I	37	37597	41842
8579	I	43	47667	58239
8531	B	72	50833	78412
8533	B	17	21120	20396
8535	B	30	32068	36240
8539	B	36	5641	11812
8577	B	2	217115	204438
8578	B	46	18840	16442

Table C.65 Raw Data Returned By Laboratory 28 – screening of unirradiated samples

SP number	Status	Code number	Lab 28	
			Pot 1	Pot 2
8512	U	67	697	599
8513	U	31	263	374
8514	U	56	1031	2340
8515	U	42	377	270
8516	U	25	1026	1360
8517	U	58	527	353
8518	U	54	767	312
8519	U	39	312	263
8520	U	68	692	800
8521	U	3	365	488
8523	U	12	473	287
8525	U	1	2084	385
8526	U	59	508	176
8528	U	10	427	460
8529	U	11	522	501
8530	U	23	410	298
8531	U	29	631	1049
8532	U	27	1407	1093
8533	U	14	365	386
8534	U	4	430	318
8535	U	53	460	387
8536	U	19	2346	824
8538	U	61	370	157
8539	U	20	363	511
8571	U	9	595	651
8572	U	6	332	623
8573	U	60	377	215
8574	U	70	2278	1818
8575	U	71	589	1176
8576	U	13	342	490
8577	U	55	2851	4193
8578	U	28	632	509
8579	U	57	313	295

Non-negative results shaded

Table C.66 Raw Data Returned By Laboratory 28 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 28	
			Pot 1	Pot 2
8512	I	47	34514	31954
8513	I	26	6058085	2581105
8514	I	64	12702482	11417309
8515	I	35	25336	17021
8516	I	18	721293	846620
8517	I	5	493770	574905
8518	I	33	249094	289214
8519	I	24	43563	37591
8520	I	69	13424	12220
8521	I	38	23381	22817
8523	I	32	270452	294572
8525	I	8	59002	32631
8526	I	50	27572	22464
8528	I	62	6684711	3786616
8529	I	51	115030	88303
8530	I	21	1124	2031
8531	I	45	317801	345380
8532	I	49	92440	87119
8533	I	15	59988	52430
8534	I	65	10907	8264
8535	I	66	139954	135493
8536	I	44	1100775	849671
8538	I	16	4432	3273
8539	I	48	34955	31447
8571	I	34	842672	804175
8572	I	41	61052	32013
8573	I	7	2724	7944
8574	I	40	1249000	1296348
8575	I	63	6105	4181
8576	I	52	284462	318662
8577	I	22	153910	151195
8578	I	37	83264	83890
8579	I	43	158020	106559
8531	B	72	29890	88722
8533	B	17	1613	715
8535	B	30	741	949
8539	B	36	1649	2605
8577	B	2	9181	8900
8578	B	46	675	675

Table C.67 Raw Data Returned By Laboratory 28 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 28	
			Pot 1	Pot 2
8512	U	67	14618	13865
8513	U	31	9407648	3979723
8514	U	56	9203401	12948678
8515	U	42	8874	11065
8516	U	25	297535	326027
8517	U	58	217881	179946
8518	U	54	134110	142555
8519	U	39	29316	9800
8520	U	68	6834	5403
8521	U	3	11519	11993
8523	U	12	92443	109171
8525	U	1	21324	13289
8526	U	59	7496	16734
8528	U	10	7256934	7465576
8529	U	11	27216	29152
8530	U	23	2193	800
8531	U	29	64947	96916
8532	U	27	33080	36471
8533	U	14	21942	22668
8534	U	4	3525	3934
8535	U	53	61319	46895
8536	U	19	176580	144961
8538	U	61	1797	2941
8539	U	20	7852	7480
8571	U	9	56120	59988
8572	U	6	18550	15193
8573	U	60	1337	1000
8574	U	70	434201	422043
8575	U	71	2128	1368
8576	U	13	87906	84666
8577	U	55	270492	288981
8578	U	28	31229	23462
8579	U	57	84443	46584

Table C.68 Raw Data Returned By Laboratory 28 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 28	
			Pot 1	Pot 2
8512	I	47	16537	17132
8513	I	26	16159920	16101535
8514	I	64	9977615	12462322
8515	I	35	16425	8843
8516	I	18	412536	426159
8517	I	5	191597	224690
8518	I	33	161349	165810
8519	I	24	29670	26908
8520	I	69	9380	12095
8521	I	38	13630	13468
8523	I	32	137885	183532
8525	I	8	23262	17001
8526	I	50	10657	11424
8528	I	62	15897800	15702167
8529	I	51	75594	60978
8530	I	21	1286	1855
8531	I	45	134319	148807
8532	I	49	37122	35979
8533	I	15	31235	27021
8534	I	65	4152	3768
8535	I	66	78065	74444
8536	I	44	429927	384415
8538	I	16	2882	2573
8539	I	48	12902	14123
8571	I	34	412730	352615
8572	I	41	19162	29087
8573	I	7	1963	3321
8574	I	40	347727	373901
8575	I	63	2597	1634
8576	I	52	172478	227121
8577	I	22	77808	82069
8578	I	37	43518	46422
8579	I	43	74403	49514
8531	B	72	91023	111084
8533	B	17	14509	16178
8535	B	30	40177	38616
8539	B	36	6190	7259
8577	B	2	293107	242503
8578	B	46	37265	36529

Table C.69 Raw Data Returned By Laboratory 29 – screening of unirradiated samples

SP number	Status	Code number	Lab 29	
			Pot 1	Pot 2
8512	U	67	16712	8375
8513	U	31	389	614
8514	U	56	2711	844
8515	U	42	758	742
8516	U	25	1286	1283
8517	U	58	88	371
8518	U	54	330	310
8519	U	39	714	955
8520	U	68	10066	7657
8521	U	3	315	442
8523	U	12	355	416
8525	U	1	658	416
8526	U	59	391	287
8528	U	10	425	270
8529	U	11	376	312
8530	U	23	1545	647
8531	U	29	44580	27987
8532	U	27	21277	48399
8533	U	14	358	364
8534	U	4	267	254
8535	U	53	514	451
8536	U	19	1607	3577
8538	U	61	421	319
8539	U	20	650	525
8571	U	9	248	432
8572	U	6	465	420
8573	U	60	218	284
8574	U	70	6348	4446
8575	U	71	2503	1780
8576	U	13	644	739
8577	U	55	4577	3747
8578	U	28	36794	82173
8579	U	57	416	302

Non-negative results shaded

Table C.70 Raw Data Returned By Laboratory 29 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 29	
			Pot 1	Pot 2
8512	I	47	28205	27841
8513	I	26	3529971	3359649
8514	I	64	16387379	10000048
8515	I	35	20094	43690
8516	I	18	780543	712315
8517	I	5	452033	397588
8518	I	33	432165	442444
8519	I	24	50746	39327
8520	I	69	16046	23797
8521	I	38	34442	32939
8523	I	32	567007	484013
8525	I	8	15558	35266
8526	I	50	22205	24615
8528	I	62	10357120	5337156
8529	I	51	82544	55783
8530	I	21	1746	1502
8531	I	45	294775	203923
8532	I	49	94328	97675
8533	I	15	79323	79358
8534	I	65	19081	18543
8535	I	66	102872	97026
8536	I	44	805865	896548
8538	I	16	21111	4159
8539	I	48	34136	23117
8571	I	34	897698	1012810
8572	I	41	42489	30617
8573	I	7	1514	2280
8574	I	40	1377648	1516052
8575	I	63	40872	54925
8576	I	52	247135	258343
8577	I	22	145944	130159
8578	I	37	132950	70849
8579	I	43	137262	704778
8531	B	72	22056	21588
8533	B	17	736	735
8535	B	30	840	682
8539	B	36	2074	1865
8577	B	2	11159	7698
8578	B	46	1469	1260

Table C.71 Raw Data Returned By Laboratory 30 – screening of unirradiated samples

SP number	Status	Code number	Lab 30	
			Pot 1	Pot 2
8512	U	67	250	330
8513	U	31	288	382
8514	U	56	888	815
8515	U	42	215	401
8516	U	25	1436	711
8517	U	58	411	408
8518	U	54	387	379
8519	U	39	240	259
8520	U	68	337	408
8521	U	3	290	211
8523	U	12	256	493
8525	U	1	475	368
8526	U	59	321	455
8528	U	10	340	395
8529	U	11	411	363
8530	U	23	258	311
8531	U	29	472	527
8532	U	27	341	423
8533	U	14	414	267
8534	U	4	303	326
8535	U	53	587	447
8536	U	19	1400	1105
8538	U	61	304	331
8539	U	20	409	369
8571	U	9	549	440
8572	U	6	412	405
8573	U	60	256	274
8574	U	70	1044	1033
8575	U	71	286	255
8576	U	13	303	533
8577	U	55	2313	1757
8578	U	28	361	214
8579	U	57	339	421

Non-negative results shaded

Table C.72 Raw Data Returned By Laboratory 30 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 30	
			Pot 1	Pot 2
8512	I	47	19956	17853
8513	I	26	15269333	2140690
8514	I	64	11317068	1001799
8515	I	35	9897	6792
8516	I	18	292597	254947
8517	I	5	281399	315492
8518	I	33	214204	230262
8519	I	24	27260	33955
8520	I	69	13830	14929
8521	I	38	23039	19880
8523	I	32	198913	403476
8525	I	8	18382	79661
8526	I	50	18085	14649
8528	I	62	5938571	10836081
8529	I	51	55752	117286
8530	I	21	1314	1429
8531	I	45	79479	163363
8532	I	49	64829	39743
8533	I	15	45342	32933
8534	I	65	10768	7531
8535	I	66	76817	94361
8536	I	44	636814	593175
8538	I	16	5871	2234
8539	I	48	19176	13796
8571	I	34	434518	438536
8572	I	41	36011	19661
8573	I	7	1388	1738
8574	I	40	1237407	794197
8575	I	63	2920	2840
8576	I	52	212953	179674
8577	I	22	134807	191998
8578	I	37	59247	70484
8579	I	43	80660	78237
8531	B	72	25059	10827
8533	B	17	658	567
8535	B	30	1237	439
8539	B	36	1534	974
8577	B	2	7615	6124
8578	B	46	358	412

Table C.73 Raw Data Returned By Laboratory 31 – screening of unirradiated samples

SP number	Status	Code number	Lab 31	
			Pot 1	Pot 2
8512	U	67	253	294
8513	U	31	1266	1206
8514	U	56	1010	952
8515	U	42	393	306
8516	U	25	3224	3491
8517	U	58	571	18
8518	U	54	322	103
8519	U	39	227	244
8520	U	68	375	295
8521	U	3	444	194
8523	U	12	381	224
8525	U	1	611	484
8526	U	59	423	365
8528	U	10	295	268
8529	U	11	308	364
8530	U	23	289	282
8531	U	29	2471	1063
8532	U	27	629	378
8533	U	14	431	248
8534	U	4	290	329
8535	U	53	597	666
8536	U	19	813	883
8538	U	61	344	353
8539	U	20	437	485
8571	U	9	401	218
8572	U	6	433	389
8573	U	60	360	294
8574	U	70	664	791
8575	U	71	342	23
8576	U	13	400	416
8577	U	55	2178	1743
8578	U	28	3221	3491
8579	U	57	883	633

Non-negative results shaded

Table C.74 Raw Data Returned By Laboratory 31 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 31	
			Pot 1	Pot 2
8512	I	47	15957	13246
8513	I	26	12626482	9240995
8514	I	64	7886958	9224106
8515	I	35	4209	3653
8516	I	18	447490	293894
8517	I	5	268133	200267
8518	I	33	169472	139027
8519	I	24	28446	24628
8520	I	69	11852	13271
8521	I	38	14797	12644
8523	I	32	165124	130861
8525	I	8	11605	9176
8526	I	50	9641	7367
8528	I	62	8802033	13377612
8529	I	51	34990	28603
8530	I	21	1582	1351
8531	I	45	150004	126904
8532	I	49	39100	31920
8533	I	15	32517	24680
8534	I	65	7268	5456
8535	I	66	56525	46074
8536	I	44	575704	453872
8538	I	16	2364	2284
8539	I	48	12330	9698
8571	I	34	293134	229461
8572	I	41	18608	14508
8573	I	7	1438	1215
8574	I	40	630333	493351
8575	I	63	2167	1848
8576	I	52	121036	94883
8577	I	22	108293	84556
8578	I	37	46223	36797
8579	I	43	74121	56997
8531	B	72	9120	7457
8533	B	17	514	540
8535	B	30	1887	1154
8539	B	36	863	864
8577	B	2	3611	2978
8578	B	46	462	468

Table C.75 Raw Data Returned By Laboratory 33 – screening of unirradiated samples

SP number	Status	Code number	Lab 33	
			Pot 1	Pot 2
8512	U	67	445	326
8513	U	31	670	810
8514	U	56	1392	1116
8515	U	42	320	308
8516	U	25	806	946
8517	U	58	126	*16777011
8518	U	54	374	221
8519	U	39	433	442
8520	U	68	426	370
8521	U	3	323	347
8523	U	12	60	477
8525	U	1	453	643
8526	U	59	*16777016	357
8528	U	10	517	272
8529	U	11	414	472
8530	U	23	366	361
8531	U	29	1837	1063
8532	U	27	3816	1542
8533	U	14	263	461
8534	U	4	852	357
8535	U	53	578	482
8536	U	19	1161	2280
8538	U	61	309	264
8539	U	20	348	236
8571	U	9	493	484
8572	U	6	467	235
8573	U	60	442	204
8574	U	70	894	991
8575	U	71	360	333
8576	U	13	279	354
8577	U	55	1899	1638
8578	U	28	1167	425
8579	U	57	429	289

Non-negative results shaded
* zero-crossing error – result negative

Table C.76 Raw Data Returned By Laboratory 33 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 33	
			Pot 1	Pot 2
8512	I	47	20224	20671
8513	I	26	16168898	13067819
8514	I	64	13841231	2816721
8515	I	35	13234	17734
8516	I	18	773410	588560
8517	I	5	314380	324030
8518	I	33	214261	207000
8519	I	24	26398	49275
8520	I	69	14332	8056
8521	I	38	22734	41586
8523	I	32	223017	246611
8525	I	8	21154	73380
8526	I	50	39809	28018
8528	I	62	14824633	10787122
8529	I	51	69829	59587
8530	I	21	1226	1161
8531	I	45	171898	182307
8532	I	49	63790	78516
8533	I	15	47548	39384
8534	I	65	7887	6848
8535	I	66	89169	90837
8536	I	44	563570	552029
8538	I	16	3100	4552
8539	I	48	27824	14840
8571	I	34	500627	478735
8572	I	41	20060	31755
8573	I	7	2183	2897
8574	I	40	1093100	866587
8575	I	63	1976	939
8576	I	52	182756	163922
8577	I	22	189073	133944
8578	I	37	60051	69323
8579	I	43	137354	163131
8531	B	72	9081	19519
8533	B	17	761	685
8535	B	30	1667	671
8539	B	36	1295	1235
8577	B	2	8639	8566
8578	B	46	373	418

Table C.77 Raw Data Returned By Laboratory 34 – screening of unirradiated samples

SP number	Status	Code number	Lab 34	
			Pot 1	Pot 2
8512	U	67	640	512
8513	U	31	507	418
8514	U	56	3591	904
8515	U	42	246	240
8516	U	25	818	903
8517	U	58	320	458
8518	U	54	372	405
8519	U	39	293	324
8520	U	68	356	484
8521	U	3	341	314
8523	U	12	194	299
8525	U	1	426	523
8526	U	59	283	282
8528	U	10	532	427
8529	U	11	597	447
8530	U	23	263	250
8531	U	29	432	450
8532	U	27	447	326
8533	U	14	415	321
8534	U	4	292	263
8535	U	53	701	773
8536	U	19	313	414
8538	U	61	359	353
8539	U	20	464	340
8571	U	9	497	412
8572	U	6	276	417
8573	U	60	284	276
8574	U	70	3049	1325
8575	U	71	436	380
8576	U	13	447	559
8577	U	55	4319	2193
8578	U	28	402	609
8579	U	57	435	397

Non-negative results shaded

Table C.78 Raw Data Returned By Laboratory 34 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 34	
			Pot 1	Pot 2
8512	I	47	34678	34693
8513	I	26	7803080	6066954
8514	I	64	16028790	15137986
8515	I	35	6883	6891
8516	I	18	342196	199866
8517	I	5	175984	307263
8518	I	33	18202	20360
8519	I	24	24951	29127
8520	I	69	14472	13318
8521	I	38	13481	14413
8523	I	32	27410	250732
8525	I	8	27005	22388
8526	I	50	24649	23545
8528	I	62	7464843	15034157
8529	I	51	92559	92600
8530	I	21	474	663
8531	I	45	185828	48241
8532	I	49	74165	93443
8533	I	15	27504	13633
8534	I	65	2923	4238
8535	I	66	56864	59995
8536	I	44	610369	123612
8538	I	16	2049	1548
8539	I	48	9850	17132
8571	I	34	418119	356221
8572	I	41	9849	12448
8573	I	7	1950	2878
8574	I	40	405238	359324
8575	I	63	2426	3748
8576	I	52	338152	411458
8577	I	22	91503	103111
8578	I	37	54204	41290
8579	I	43	41669	67018
8531	B	72	12259	7529
8533	B	17	443	505
8535	B	30	424	628
8539	B	36	929	825
8577	B	2	9964	9275
8578	B	46	544	365

Table C.79 Raw Data Returned By Laboratory 35 – screening of unirradiated samples

SP number	Status	Code number	Lab 35	
			Pot 1	Pot 2
8512	U	67	374	441
8513	U	31	490	467
8514	U	56	1419	1290
8515	U	42	690	299
8516	U	25	1394	4138
8517	U	58	677	463
8518	U	54	394	399
8519	U	39	454	307
8520	U	68	525	473
8521	U	3	477	369
8523	U	12	439	409
8525	U	1	808	1939
8526	U	59	277	477
8528	U	10	342	381
8529	U	11	496	503
8530	U	23	248	330
8531	U	29	1786	1396
8532	U	27	338	410
8533	U	14	383	370
8534	U	4	405	366
8535	U	53	773	1674
8536	U	19	1991	3310
8538	U	61	347	577
8539	U	20	647	569
8571	U	9	1580	699
8572	U	6	535	392
8573	U	60	369	323
8574	U	70	2444	1547
8575	U	71	248	297
8576	U	13	3391	722
8577	U	55	3117	3553
8578	U	28	566	550
8579	U	57	484	545

Non-negative results shaded

Table C.80 Raw Data Returned By Laboratory 35 – screening of irradiated samples and blends

SP number	Status	Code number	Lab 35	
			Pot 1	Pot 2
8512	I	47	55652	38435
8513	I	26	6687907	13520225
8514	I	64	4855752	4691697
8515	I	35	40321	9952
8516	I	18	360637	328750
8517	I	5	457542	346754
8518	I	33	328567	373917
8519	I	24	142006	36820
8520	I	69	17373	17919
8521	I	38	32483	27417
8523	I	32	434999	285849
8525	I	8	34262	48209
8526	I	50	21189	14474
8528	I	62	2481252	4706400
8529	I	51	160651	92441
8530	I	21	1517	1461
8531	I	45	331744	268128
8532	I	49	105551	105819
8533	I	15	76534	65869
8534	I	65	14622	9549
8535	I	66	158956	166736
8536	I	44	1018542	1082550
8538	I	16	2347	3681
8539	I	48	31027	33223
8571	I	34	770119	762155
8572	I	41	31204	40733
8573	I	7	2361	3713
8574	I	40	1289735	1293027
8575	I	63	5885	7550
8576	I	52	301427	238782
8577	I	22	220781	155387
8578	I	37	90358	77964
8579	I	43	169695	225004
8531	B	72	68513	25644
8533	B	17	983	874
8535	B	30	1054	1031
8539	B	36	7384	3637
8577	B	2	11890	6550
8578	B	46	527	503

Table C.81 Raw Data Returned By Laboratory 35 – calibrated PSL for unirradiated samples

SP number	Status	Code number	Lab 35	
			Pot 1	Pot 2
8512	U	67	28255	34630
8513	U	31	11869210	9413035
8514	U	56	9453898	10651708
8515	U	42	7588	10981
8516	U	25	227744	140528
8517	U	58	410011	305164
8518	U	54	219644	221910
8519	U	39	24673	19165
8520	U	68	15135	7578
8521	U	3	20469	28468
8523	U	12	203771	321662
8525	U	1	34885	31967
8526	U	59	14855	13056
8528	U	10	13145418	13028800
8529	U	11	67459	43159
8530	U	23	1416	1616
8531	U	29	161358	166620
8532	U	27	58543	62625
8533	U	14	41800	39007
8534	U	4	9052	6360
8535	U	53	102496	90155
8536	U	19	781618	741704
8538	U	61	3039	4926
8539	U	20	22836	13477
8571	U	9	140340	102332
8572	U	6	14369	18451
8573	U	60	1608	2603
8574	U	70	1012745	1226859
8575	U	71	5303	4687
8576	U	13	181198	161513
8577	U	55	579590	673549
8578	U	28	55067	98299
8579	U	57	82637	130128

Table C.82 Raw Data Returned By Laboratory 35 – calibrated PSL for irradiated samples and blends

SP number	Status	Code number	Lab 35	
			Pot 1	Pot 2
8512	I	47	48576	72308
8513	I	26	965942	11089817
8514	I	64	10908597	156770
8515	I	35	13135	39916
8516	I	18	905861	469724
8517	I	5	632458	577179
8518	I	33	332197	373193
8519	I	24	49778	145808
8520	I	69	15806	20547
8521	I	38	36864	39136
8523	I	32	283921	337326
8525	I	8	48120	26110
8526	I	50	34434	31289
8528	I	62	8600844	14840439
8529	I	51	146832	161489
8530	I	21	2364	2624
8531	I	45	629832	353883
8532	I	49	129985	109207
8533	I	15	80269	71538
8534	I	65	17763	12250
8535	I	66	143069	133099
8536	I	44	1446309	1233774
8538	I	16	5752	6274
8539	I	48	37396	102911
8571	I	34	1147262	1028591
8572	I	41	49358	54279
8573	I	7	2557	3368
8574	I	40	1771630	1572129
8575	I	63	7013	7631
8576	I	52	288663	299463
8577	I	22	201707	206819
8578	I	37	129926	94605
8579	I	43	1898375	295421
8531	B	72	218681	179140
8533	B	17	38061	
8535	B	30	82009	71075
8539	B	36	27824	16070
8577	B	2	633541	509575
8578	B	46	50535	63693

Lab No.	1								
TL reader type	TLD 3500								
Units for intensity	nC								
MDL	0,37 nC								
LiF data									
Peak V temperature /°C									
Chip 1	235								
Chip 2	233								
Mean	234								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	6.49	5810	0.001		16.38	7830	0.002		untreated
2	13230	10750	1.23		6231	4208	1.48		irradiated
3	73.16	673	0.109	2 peaks by channel 60+100	160.3	1881	0.0085	2 peaks by channel 60+100	mixtures containing irradiated materials
4	27.51	26.7	1.03		1.46	10.51	0.14		irradiated
5	0.22	15.91	0.014		0.46	18.46	0.025		untreated
6	0.18	46.99	0.004		0.41	32.91	0.012		untreated
7	2.836	299.9	0.01		1.344	2435	0.0006		untreated
8	1.12	4600	0.0002		1.226	2528	0.0005		untreated
9	2322	1917	1.21		916.5	1029	0.89		irradiated
10	0.2	52.05	0.004		0.16	53.39	0.003		untreated
11	164.4	83.49	1.97		43.76	55.02	0.8		irradiated
12	2.44	131.7	0.019	2 peaks by channel 59+100	2.4	191.3	0.013	2 peaks by channel 61+100	mixtures containing irradiated materials
13	11560	6990	1.65		9760	12860	0.76		irradiated
14	130.5	3583	0.036	peak-max. by channel 75	27.17	1660	0.016	peak-max.by channel 80	mixtures containing irradiated materials
15	31.89	6571	0.005		10.1	2653	0.004		untreated
16	2.41	2073	0.001		10.19	3061	0.003		untreated
17	4.496	3742	0.001		3.389	2185	0.002		untreated
18	4695	3045	1.54		2542	2301	1.1		irradiated

Table C.83 TL data for TL laboratory 1

Lab No.	2.00								
TL reader type	Harshaw TLD 4000								
Units for intensity	nC								
MDL	7.50								
LiF data									
Peak V temperature /°C									
Chip 1	273.50								
Chip 2	277.00								
Mean	275.25								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	28.03	8648.23	0.00	maximum 369°C	2.52	1915.77	0.00	maximum 413°C	untreated
2	8671.23	3920.89	2.21	maximum at 245°C with shoulder in front of the peak; lower, broad maximum 382°C	7933.50	3743.26	2.12	maximum at 245°C with shoulder in front of the peak; lower, broad maximum 360°C	irradiated
3	296.52	1494.26	0.20	maximum at 249°C with shoulder in front of the peak; lower, broad maximum 403°C	122.78	1528.71	0.08	maximum at 242°C with shoulder in front of the peak; lower, broad maximum 374°C	irradiated, only a part of a mixture, because
4									no possible
5									no possible
6									no possible
7	0.84	408.11	0.00	maximum at 327°C	0.35	660.51	0.00	no maximum	untreated
8	0.54	433.42	0.00	broad maximum at 400°C	0.55	821.97	0.00	broad plateau 313°C - 400°C	untreated
9	553.50	409.04	1.35	round peak maximum at 229°C	848.94	791.58	1.07	round peak maximum at 220°C	irradiated
10	0.30	151.13	0.00	maximum at 400°C, like blank	0.31	135.02	0.00	maximum at 400°C, like blank	untreated
11	983.36	708.65	1.39	maximum at 221°C, lower peak 393°C	20.79	11.93	1.74	maximum at 241°C lower peak 391°C	irradiated
12	0.36	13.25	0.03	maximum at 400°C, like blank not enough minerals	5.56	27.33	0.20	sharpe maximum 244°C lower peak 391°C	irradiated, only a part of a mixture, because
13	1316.69	1220.52	1.08	maximum at 213°C	748.55	566.32	1.32	maximum at 248°C with fronting	irradiated
14	3.49	261.08	0.01	plateau from 295-390°C	4.58	640.37	0.01	broad maximum at 361°C	untreated
15	4.69	1204.83	0.00	plateau from 295-390°C	7.91	954.11	0.01	broad peak, maximum at 296°C	untreated
16	17.41	1651.68	0.01	lower maximum 209°C, broad peak maximum 391°C	3.64	1078.42	0.00	broad peak, maximum at 362°C	mixture irradiated material
17	9.34	3143.09	0.00	plateau from 329-383°C	4.78	2849.53	0.00	plateau from 317-370°C	untreated
18	2285.56	1531.60	1.49	maximum 235°C, fronting	3150.55	2151.98	1.46	maximum 248°C, fronting	irradiated

Table C.84 TL data for TL laboratory 2

Lab No.	3								
TL reader type	TLD 3500								
Units for intensity	nC								
MDL	3,12nC								
LiF data									
Peak V temperature /°C									
Chip 1	241								
Chip 2	246								
Mean	243.5								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	4.375	897	0.00	no peak	6.159	47.93	0.13	no peak	untreated
2	207.5	17.08	12.15	breadth peak in ROI1	5429	920	5.90	peak in ROI1	irradiated
3	384.3	71.59	5.37	peak in ROI1	87.35	164.5	0.53	small peak	irradiated
4	1.448	0.7514	1.93	little peak in ROI1	1.137	7.495	0.15	little peak in ROI1	(irradiated)
5	0.444	6.541	0.07	no peak	0.3103	5.749	0.05	no peak	(untreated)
6	0.5627	3.813	0.15	no peak	0.2581	3.911	0.07	no peak	(untreated)
7	4.413	72.58	0.06	no peak	1.143	113.2	0.01	no peak	untreated
8	3.542	160.8	0.02	little breadth peak	11.43	302.5	0.04	little breadth peak	untreated
9	220.1	108.5	2.03	peak in ROI1	553.9	179.3	3.09	peak in ROI1	irradiated
10	0.2809	0.9046	0.31	no peak	0.5128	14	0.04	no peak	(untreated)
11	1.437	0.8806	1.63	little breadth peak	1.223	0.5657	2.16	little breadth peak	(irradiated)
12	1.039	1.049	0.99	little peak in ROI1	4.038	15.67	0.26	little peak in ROI1	(mixtures containing irradiated materials)
13	662.5	286.1	2.32	peak in ROI1	1471	527	2.79	peak in ROI1	irradiated
14	53.65	1291	0.04	breadth peak higher temp.	10.07	416.3	0.02	no peak	untreated
15	36.9	1921	0.02	breadth peak higher temp.	16.19	544.5	0.03	breadth peak higher temp.	untreated
16	6.962	159.8	0.04	little peak in ROI1	0.5932	54.05	0.01	no peak	mixtures containing irradiated materials
17	0.4123	53.25	0.01	no peak	3.489	815.1	0.00	no peak	untreated
18	1105	243.3	4.54	peak in ROI1	28.47	5.773	4.93	peak in ROI1	irradiated

Table C.85 TL data for TL laboratory 3

Lab No.	4								
TL reader type	Harshaw TLD-Reader 3500								
Units for intensity	nano Coulomb (nC)								
MDL	20 nC								
LiF data									
Peak V temperature /°C									
Chip 1	245								
Chip 2	245								
Mean	245								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	48	4856	0.0099	no peak					**untreated**
2	5253	7200	0.7296	gaussian, normal					**irradiated**
3	645	3523	0.1831	gaussian, normal					**irradiated**
4	98	85	1.1529	gaussian, normal					**irradiated**
5	0	48	0.0000	no peak					**untreated**
6	5	10	0.5000	no peak					**untreated**
7	51	2687	0.0190	gaussian, normal					**irradiated**
8	0	1877	0.0000	no peak	0	2447	0	no peak	**untreated**
9	2282	1401	1.6288	gaussian, normal	1798	1968	0.91361789	gaussian, normal	**irradiated**
10	169	119	1.4202	gaussian, normal					**irradiated**
11	72	36	2.0000	gaussian, normal					**irradiated**
12	*9*	*2*	4.5000	very small peak					*????*
13	3078	1711	1.7989	gaussian, normal					**irradiated**
14	74	1489	0.0497	no paek					**untreated**
15	27	487	0.0554	no gaussian					**irradiated**
16	119	824	0.1444	no paek					**untreated**
17	28	715	0.0392	gaussian, normal					**irradiated**
18	8	1374	0.0058	gaussian, normal					**irradiated**

Table C.86 TL data for TL laboratory 4

Lab No.	**5**								
TL reader type	Harshaw 3500		MDL	0.0238		**LiF data**			
Units for intensity	nC			0.0153		Peak V temperature /°C			
				0.0285		Chip 1	91		
				0.0311		Chip 2	90		
				0.0321		Mean	90.5		
			Average *x*	0.0262					
			Standard deviation *x*s n	0.0069					
			MDL (x + 3s)	0.0468					
			10*MDL	0.468					
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	6.80	2256	0.00	untreated	3.79	1108	0.00	untreated	negativ
2	16710	4755	3.5	irradiated	5320	1489	3.6	irradiated	positiv
3	348	1693	0.21	irradiated (mixture)	352	924	0.38	irradiated (mixture)	positiv
4	150	58.7	2.6	irradiated					positiv
5	5.25	28.7	0.18	irradiated (mixture)					positiv
6	0.05	0.29	0.17						<10 MDL
7	6.61	1956	0.00	untreated	6.4	2503	0.00	untreated	negativ
8	3.77	4111	0.00	untreated					negativ
9	11260	5510	2.0	irradiated	10740	4387	2.4	irrdadiated	positiv
10	4.72	48.6	0.1	irradiated (mixture)					positiv
11	338	122	2.8	irradiated					positiv
12	19.1	10.8	1.8	irradiated					positiv
13	14930	4003	3.7	irradiated	14690	2673	5.5	irradiated	positiv
14	310	3819	0.1	irradiated (mixture)	106	1247	0.1	irradiated (mixture)	positiv
15	50.8	5839	0.01	untreated	62.5	3169	0.02	untreated	negativ
16	12.4	3201	0.00	untreated					negativ
17	14.3	2592	0.01	untreated					negativ
18	8475	2618	3.2	irradiated	7572	failed		irradiated	positiv

Table C.87 TL data for TL laboratory 5

Lab No.	6								
TL reader type	HARSHAW TLD 3500								
Units for intensity	nC								
MDL	0,098 nC								
Heating rate	6 oC/s								
LiF data									
Peak V temperature /°C									
Chip 1	235.6								
Chip 2	233.8								
Mean	234.7								
Sample data									
	Aliquot A				**Aliquot B**				
Sample	**G1 Intensity**	**G2 Intensity**	**G1/G2**	**G1 peak shape**	**G1 Intensity**	**G2 Intensity**	**G1/G2**	**G1 peak shape**	**Evaluation**
1	3.98	1685	0.002	untreated	5.5	2836	0.002	untreared	untreated
2	5584	3001	1.861	irradiated	3389	1392	2.435	irradiated	irradiated
3	749	1683	0.445	irradiated	118	936	0.126	irradiated	mixture
4									
5									
6									
7	0.81	1278	0.001	untreated					
8	1.01	1532	0.001	untreated	1.16	1830	0.001	untreated	untreated
9	1756	1304	1.347	irradiated					irradiated
10	0.15	45	0.003	untreated					untreated
11	387	382	1.013	irradiated					irradiated
12	8.31	194	0.043	irradiated					mixture
13	3698	2857	1.294	irradiated	3363	2476	1.358	irradiated	irradiated
14	33.56	2096	0.016	untreated	3.28	581	0.006	untreated	untreated
15	7.66	1890	0.004	untreated	18.72	2194	0.009	untreated	untreated
16	2.21	741	0.003	untreated	1.28	736	0.002	untreated	untreated
17	0.92	802	0.001	untreated	1.4	597	0.002	untreated	untreated
18	1064	718	1.482	irradiated	1840	1025	1.795	irradiated	irradiated

Table C.88 TL data for TL laboratory 6

Lab No.	7							
TL reader type	Harshaw M3500							
Units for intensity	nC							
MDL	0							
LiF data								
Peak V temperature /°C								
Chip 1	260							
Chip 2	250							
Mean	255							
Sample data								
	Aliquot A				Aliquot B			
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G
1	3	42	0.06	no distinct peak in relevant temperature range	5	101	0.05	no
2	518	24	21.75	distinct peak at 225°C	817	86	9.47	di
3	38	8	4.64	distinct peak at 215°C	113	13	8.61	di
4	48	34	1.42	distinct peak at 200°C	10	8	1.15	sn
5	0	3	0.05	No signal in the relevant temperature range	0	2	0.07	N
6	0	7	0.03	No signal in the relevant temperature range	0	1	0.11	N
7	5	42	0.13	flat signal with peak at 200°C	2	58	0.03	no
8	1	42	0.03	no distinct peak in relevant temperature range	2	74	0.02	no
9	200	56	3.58	distinct peak at 220°C	590	251	2.35	di
10	0	7	0.03	No signal in the relevant temperature range	0	30	0.01	N
11	18	12	1.50	small peak at 200°C	5	4	1.41	sn
12	12	22	0.54	small peak at 210°C	0	2	0.12	N
13	8455	1594	5.30	very large peak at 200°C	7801	2622	2.98	ve
14	96	5270	0.02	signal starts at 140°C and rises from there on up to 400°C. No distinct peak in relevant temperature range	99	2680	0.04	si
15	2	320	0.01	signal starts in the relvant temperatur range, but the small peak is at 300°C and therefore not within the relevant temperature range.	2	332	0.00	si
16	35	1691	0.02	signal starts at 90°C°C and rises from there on up to 400°C. No distinct peak in relevant temperature range	7	1755	0.00	si
17	4	785	0.00	Signal starts before the relevant temperature range and rises through it up to 400°C without a distinct peak	9	1845	0.00	S
18	13700	1572	8.72	Very high signal with distinct peak at 210°C	17550	3203	5.48	V

Table C.89 TL data for TL laboratory 7

Lab No.	8								
TL reader type	Risö TL/OSL-DA15								
Units for intensity	counts								
MDL (full Temperaturintervall I)	502								
LiF data									
Peak V temperature /°C									
Chip 1	254								
Chip 2	254								
Mean	254								
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	118 135	28 316 457	0.004	no Max. in temperatur interval I	357 977	36 675 782	0.01	no Max. in temperatur interval I	not irradiated
2	48 669 589	33 114 212	1.47	wide glow-curve, Max. in temperatur interval I	23 724 372	14 433 661	1.64	wide glow-curve, Max. in temperatur interval I	irradiated
3	7 843 999	30 551 003	0.26	wide glow-curve, Max. in temperatur interval I	41 753 048	63 846 699	0.65	wide glow-curve, Max. in temperatur interval I	irradiated (probably mixture of irradiated
4	181 043	166 066	1.09	Max. in temperatur interval I	3 080	4 087*		small Max. in temperatur interval I	irradiated (conclusion from mea
5	327	663 191	0.0005	no Max. in temperatur interval I	366	1 321 061	0.0003	no Max. in temperatur interval I	not irradiated
6	348	7 404	0.05	no Max. in temperatur interval I	353	843*			probably (conclusion from measurement
7	10 819	21 683 979	0.0005	no Max. in temperatur interval I	3 093	9 332 116	0.0003	no Max. in temperatur interval I	not irradiated
8	11 483	19 475 343	0.0006	no Max. in temperatur interval I	18 343	35 595 880	0.0005	no Max. in temperatur interval I	not irradiated
9	41 580 251	37 680 886	1.1	Max. in temperatur interval I	25 775 572	22 005 892	1.17	Max. in temperatur interval I	irradiated
10	704	4 883 669	0.0001	no Max. in temperatur interval I	2 067	4 049 836	0.0005	no Max. in temperatur interval I	not irradiated
11	1 580 084	1 139 931	1.39	Max. in temperatur interval I	2 891 780	2 324 858	1.24	Max. in temperatur interval I	irradiated
12	980 358	11 733 319	0.08	Max. in temperatur interval I	656 250	7 717 984	0.09	Max. in temperatur interval I	irradiated (probably mixture of irradiated
13	29 353 880	26 282 946	1.12	Max. in temperatur interval I	18 959 289	18 616 101	1.02	Max. in temperatur interval I	irradiated
14	771 205	15 365 051	0.05	Max. in temperatur interval I	77 171	19 865 724	0.004	no Max. in temperatur interval I	irradiated, conclusion (probably mixture of a small am
15	116 508	12 889 750	0.009	no Max. in temperatur interval I	341 299	49 398 361	0.007	no Max. in temperatur interval I	not irradiated
16	22 018	10 331 106	0.002	no Max. in temperatur interval I	13 278	6 083 037	0.002	no Max. in temperatur interval I	not irradiated
17	9 715	2 617 519	0.004	no Max. in temperatur interval I	23 389	7 876 940	0.003	no Max. in temperatur interval I	not irradiated
18	26 625 387	19 113 548	1.39	Max. in temperatur interval I	15 056 059	10 622 814	1.42	Max. in temperatur interval I	irradiated

Table C.90 TL data for TL laboratory 8

Lab No.	10							
TL reader type	Harshaw 3500							
Units for intensity	nC							
MDL	0.54							
LiF data	Peak V temperature /°C							
Chip 1	248.00							
Chip 2	244.00							
Mean	246.00							
Sample data								
	Aliquot A				Aliquot B			
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape
1	3.41	1483.00	0.00230	weak peak at about 300°C	4.32	2703.00	0.00160	weak peak at about 300°C
2	13030.00	1681.00	7.75134	peak at about 212°C	7341.00	2743.00	2.67627	peak at about 229°C
3	773.20	3868.00	0.19990	peak at about 220°C	797.60	4162.00	0.19164	peak at about 220°C
4	2.56	13.17	0.19438	peak at about 200°C	1.10	14.28	0.07675	peak at about 200°C
5	0.20	7.01	0.02853	no peaks are visible	0.21	8.37	0.02557	no peaks are visible
6	0.26	62.71	0.00415	no peaks are visible	0.26	64.56	0.00397	no peaks are visible
7	31.79	15848.00	0.00201	peaks at about 200 and 300°C	26.12	12478.00	0.00209	peaks at 200 and 300°C
8	11.26	10234.00	0.00110	no peaks are visible	4.50	6656.00	0.00068	no peaks are visible
9	6443.00	6441.00	1.00031	peak at about 200°C	1265.00	1707.00	0.74107	peak at about 200°C
10	0.28	15.53	0.01777	no peaks are visible	0.25	165.50	0.00153	no peaks are visible
11	55.05	58.51	0.94086	peak at about 200°C	0.76	10.77	0.07057	peak at about 200°C
12	0.43	10.02	0.04281	very weak peak at about 200 °C	0.41	7.11	0.05753	very weak peak at about 200 °C
13	34700.00	23273.00	1.49100	peak at about 200°C	35300.00	24330.00	1.45088	peak at about 200°C
14	240.20	20469.00	0.01173	weak peak at about 200°C	243.30	16973.00	0.01433	weak peak at about 200°C
15	50.58	13900.00	0.00364	weak peak at about 300°C	27.70	8778.00	0.00316	weak peak at 300°C
16	9.93	5302.00	0.00187	peaks at about 200 and 300°C	6.68	3287.00	0.00203	peaks at 200 and 300°C
17	4.14	10880.00	0.00038	weak peak at about 300 °C	10.74	8670.00	0.00124	no peaks are visible
18	10397.00	10781.00	0.96438	peak at about 225 °C	13840.00	13907.00	0.99518	peak at about 225 °C

Table C.91 TL data for TL laboratory 10

Lab No.	TL 11								
TL reader type	TL-DA-15; RISO								
Units for intensity									
MDL	358.49								
LiF data									
Peak V temperature /°C									
Chip 1	255								
Chip 2	259								
Mean	257								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	65845	14792736	0.004	max. 340	28386	14514844	0.002	max. 340	unirradiated
2	49826572	27014391	1.844	max. 200 and 340	50477721	23558922	2.143	max. 200 and 340	mixture
3	4207445	23531350	0.179	max. 200 and 340	2801563	9169738	0.306	max. 200 and 340	mixture
4	1023013	567270	1.803	max. 200	803912	493360	1.629	max. 200	irradiated
5	-13	28382	0.000	bckgrd.	241	125206	0.002	bckgrd.	unirradiated
6	128	56752	0.002	bckgrd.	59	146180	0.000	bckgrd.	unirradiated
7	1143	2156883	0.001	max. 340	8907	6385980	0.001	max. 230 and 340	mixture
8	50735	19832392	0.003	max. 300	17927	14962105	0.001	max. 300	unirradiated
9	22523123	10090741	2.232	max. 200	47781830	25135827	1.901	max. 200	irradiated
10	386	1307815	0.000	bckgrd.	349	204658	0.002	bckgrd.	unirradiated
11	254682	98053	2.597	max. 200	895046	451928	1.981	max. 200	irradiated
12	37323	114953	0.325	max. 200	1002	102507	0.010	bckgrd.	irradiated
13	129255206	81273060	1.590	max. 200	117042721	84043022	1.393	max. 200	irradiated
14	1339775	47970540	0.028	max. 200 and 300	957453	48487761	0.020	max. 300	mixture
15	505550	53504181	0.009	max. 270 - 340	364121	24918540	0.015	max. 270 - 340	unirradiated
16	473832	5382455	0.088	max. 200 and 300	13077	3923832	0.003	max. 300	mixture
17	31727	7395225	0.004	max. 340	44960	9492378	0.005	max. 300-340	unirradiated
18	25774335	14059233	1.833	max. 200	18346005	11413995	1.607	max. 200 and 340	irradiated

Table C.92 TL data for TL laboratory 11

Lab No.	13							
TL reader type	Risoe TL-DA-15		Units for intensity	counts	MDL	2492		
LiF data		Peak V temperature /°C						
Chip 1		263						
Chip 2	xxx							
	Mean	263						
	Aliquot A				Aliquot B			
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape
	186-245°C							
1	75016	26675090	0.003	Max at 350°C	119775	2.5E+07	0.005	Max at 350°C
2	41434815	16419165	2.524	Max at 215°C; shoulder at 320°C	46272445	1.9E+07	2.405	Max at shoulder at 330°C
3	5032240	21032474	0.239	Max at 200°C; shoulder at 330°C	8817061	2.7E+07	0.321	Max at 205°C; shoulder at 330°C
4	2950165	1363530	2.164	Max at 210°C	2982827	1513771	1.97	Max at 200°C
5	45822	1293515	0.035	first peak at 220°C;second peak at 350°C very small signals	17697	1193987	0.015	rise from160°C; shoulder at 200°C;Max at 360°C
6	56249	2118013	0.027	Max at 190°C new rise from 280°C to 360°C; very small signals	5086	1148071	0.004	Max at 360°C
7	47884	15195815	0.003	rise from 200°CMax at 320°C;very small signal	59028	1.8E+07	0.003	rise from 160°CMax at 340°C;very small signal
8	35879	21265834	0.002	rise from 200°C,Max between 330°C and 340°C;very small signal	39561	1.4E+07	0.003	rise from 200°C,Max between 280°C and 360°C;very small signal
9	8548668	5831549	1.466	Max at 190°C	8590994	5744781	1.495	Max at 200°C
10	1996	853513	0.002	very small signal no maximum	3015	839956	0.004	Max at.340°C;small signal
11	1310899	1127275	1.163	Max at 195°C	5750470	2849275	2.018	Max at 200°C
12	438296	1099691	0.399	Max at 190°C	243564	2681214	0.091	Max at 180°C
13	60718671	39137580	1.551	Max at 195°C, shoulder between 230°C and 340°C	85040694	5.6E+07	1.506	Max at 200°C, shoulder at 240°C
14	683713	30674122	0.022	first rise to 190°C, shoulder between 240°C and 280°C, rise from 320°C	541249	2.8E+07	0.019	first rise to 190°C-200°C,shoulder between 250°C and 280°C,rise fr
15	205570	26733480	0.008	Max at 280°C	368335	5.3E+07	0.007	Max between 270°C and 280°C
16	135128	22797343	0.006	Max at 320°C	352618	2.9E+07	0.012	first peak at 195°C;new rise with second max at 320°C
17	70853	18044642	0.004	Max at.320°C	99460	2.6E+07	0.004	Max at.320°C
18	43462457	26101173	1.665	Max at 200°C,shoulder at 320°C	49746066	3.1E+07	1.596	Max at 200°C, shoulder at 320°C

Table C.93 TL data for TL laboratory 13

Lab No.	14								
TL reader type	Harshaw 3500								
Units for intensity	nC								
MDL	0.354								
LiF data									
Peak V temperature /°C									
Chip 1	220								
Chip 2	220								
Mean	220								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	**2.62**	**1993**	**0.0013146**	**absent**	**4.705**	**844.9**	**0.00556871**	**dominent**	**mixture**
2	4272	3085	1.38476499	dominent	3708	3247	1.14197721	dominent	positive
3	283	2115	0.13380615	dominent	172.1	1029	0.16724976	dominent	positive
4	8.56	9.527	0.898499	dominent	3.01	3.847	0.78242787	dominent	positive
5	**0.14**	**6.195**	**0.02259887**	**absent**	**0.361**	**20.22**	**0.01785361**	**dominent**	**mixture**
6	**0.229**	**13.11**	**0.01746758**	**minor**	**12.46**	**33.2**	**0.3753012**	**dominent**	**mixture**
7	**0.902**	**1010**	**0.00089307**	**dominent**	**0.713**	**967.3**	**0.0007371**	**absent**	**mixture**
8	0.692	1605	0.00043115	absent	0.614	2934	0.00020927	absent	negative
9	4572	4827	0.94717216	dominent	3898	4184	0.93164436	dominent	positive
10	0.281	24.55	0.01144603	absent	0.218	40.92	0.00532747	absent	negative
11	33.79	24.93	1.35539511	dominent	51.76	100.5	0.51502488	dominent	positive
12	13.06	67.1	0.19463487	dominent	7.819	17.97	0.43511408	dominent	positive
13	26830	18960	1.41508439	dominent	25550	20410	1.25183733	dominent	positive
14	**221.8**	**18250**	**0.01215342**	**dominent**	**287.7**	**15930**	**0.01806026**	**dominent**	**mixture**
15	4.582	5256	0.00087177	absent	6.123	12160	0.00050354	absent	negative
16	2.53	2453	0.00103139	absent	4.292	1189	0.00360976	absent	negative
17	1.616	1931	0.00083687	absent	0.847	1005	0.00084279	absent	negative
18	3781	3196	1.1830413	dominent	404.8	347.4	1.1652274	dominent	positive

Table C.94 TL data for TL laboratory 14

Lab No.	15								
TL reader type	TL-DA-10								
Units for intensity	counts								
MDL	636								
LiF data									
Peak V temperature /°C									
Chip 1	298								
Chip 2	288								
Mean	293								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	1710	5526361	3.1E-04	max. at 356 deg. C	922	3058422	3.0E-04	max. at 484 deg. C	untreated
2	369843751	20192801	1.8E+01	max. at 224 deg. C	5587022	3115646	1.8E+00	max. at 202 deg. C	irradiated
3	6906284	13843432	5.0E-01	max. at 202 deg. C	109639	5901970	1.9E-02	max. at 362 deg. C	mixture
4	284351	167551	1.7E+00	max. at 166 deg. C	-	-	-	-	-
5	22951	8134351	2.8E-03	max. at 434 deg. C	-	-	-	-	-
6	10851	1077751	1.0E-02	max. at 484 deg. C	-	-	-	-	-
7	2255	14684444	1.5E-04	max. at 492 deg. C	1086	11815093	9.2E-05	max. at 372 deg. C	untreated
8	735	7183306	1.0E-04	max. at 392 deg. C	955	5240851	1.8E-04	max. at 402 deg. C	untreated
9	4105132	6968942	5.9E-01	max. at 208 deg. C	13300929	20234384	6.6E-01	max. at 212 deg. C	irradiated
10	10351	639151	1.6E-02	max. at 498 deg. C	-	-	-	-	-
11	338651	339551	1.0E+00	max. at 198 deg. C	-	-	-	-	-
12	41651	522151	8.0E-02	max. at 458 deg. C	-	-	-	-	-
13	7455246	8837855	8.4E-01	max. at 214 deg. C	10957351	15935211	6.9E-01	max. at 200 deg. C	irradiated
14	770276	20983301	3.7E-02	max. at 188 deg. C	58375	19059194	3.1E-03	max. at 290 deg. C	mixture
15	136351	110821451	1.2E-03	max. at 298 deg. C	44091	30605051	1.4E-03	max. at 306 deg. C	untreated
16	9512	8152399	1.2E-03	max. at 330 deg. C	2283	9540472	2.4E-04	max. at 368 deg. C	untreated
17	6627	10318861	6.4E-04	max. at 360 deg. C	4347	13892094	3.1E-04	max. at 360 deg. C	untreated
18	12641168	13396818	9.4E-01	max. at 212 deg. C	7273061	10125609	7.2E-01	max. at 208 deg. C	irradiated

Table C.95 TL data for TL laboratory 15

Lab No.	No18								
TL reader type	Harshow TL 3500								
Units for intensity	n C								
MDL	2.56								
LiF data									
Peak V temperature /°C									
Chip 1	229								
Chip 2	235								
Mean	232								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1	183.86	5814.26	0.032	Peak at 329°C	232.40	5644.12	0.041	Peak at 335°C	Un-irradiated
2	21978.15	10832.01	2.029	Peak at 198°C	16345.85	8614.27	1.898	Peak at 198°C	Irradiated
3	4362.90	16132.80	0.270	Peak at 186°C	3524.93	16228.32	0.217	Peak at 187°C	Irradiated(mixture)
4	2555.66	1293.03	1.976	Peak at 179°C	2095.25	1010.35	2.074	Peak at 183°C	Irradiated
5	8.07	622.83	0.013	Peak at 186°C	12.40	736.26	0.017	Peak at 189°C	Irradiated(mixture)
6	7.17	930.38	0.008	no peak was observed	8.19	1003.16	0.008	no peak was observed	Un-irradiated
7	106.75	13944.44	0.008	small shoulder at 189°C	187.41	25724.32	0.007	small shoulder at 183°C	Irradiated(mixture)
8	88.17	14580.86	0.006	Peak at 322°C	100.71	18419.95	0.005	Peak at 317°C	Un-irradiated
9	23297.25	17080.90	1.364	Peak at 183°C	24074.51	17478.48	1.377	Peak at 183°C	Irradiated
10	13.56	1075.97	0.013	no peak was observed	16.38	1946.71	0.008	no peak was observed	Un-irradiated
11	4857.31	1936.39	2.508	Peak at 181°C	5729.54	2400.65	2.387	Peak at 183°C	Irradiated
12	172.90	675.73	0.256	Peak at 188°C	62.10	626.72	0.099	Peak at 183°C	Irradiated(mixture)
13	6691.95	2362.35	2.833	Peak at 185°C	4191.67	1746.66	2.400	Peak at 186°C	Irradiated
14	432.21	10390.84	0.042	Peak at 190°C	645.84	14423.25	0.045	Peak around 200-250C(broad)	Irradiated(mixture)
15	330.76	14384.48	0.023	Peak at 266°C	175.75	8417.15	0.021	Peak at 263°C	Un-irradiated
16	206.18	9187.53	0.022	small shoulder at 189°C	100.41	5519.04	0.018	small shoulder at 175°C	Irradiated(mixture)
17	92.65	5713.64	0.016	Peak at 348°C	137.20	9145.05	0.015	Peak at 348°C	Un-irradiated
18	21255.62	12226.83	1.738	Peak at 181°C	17872.33	10408.60	1.717	Peak at 183°C	Irradiated

Table C.96 TL data for TL laboratory 18

Lab No.	24								
TL reader type	Harshaw TLD 3500								
Units for intensity	nC								
MDL	1.9								
LiF data									
Peak V temperature /°C									
Chip 1	228								
Chip 2	228								
Mean	228								
Sample data									
	Aliquot A				Aliquot B				
Sample	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	G1 Intensity	G2 Intensity	G1/G2	G1 peak shape	Evaluation
1 (29)	7.497	1145	0.007	Pmax 202°C	10.44	3946	0.003	no Peak	negative
2(45)	10340	6752	1.531	Pmax 211°C	5836	4793	1.218	Pmax 228°C	positive
3(72)	619	3536	0.175	Pmax 225°C	3536	4339	0.815	Pmax 222°C	positive
4(15)	56.43	6787	0.008	Pmax 215°C	67.87	109.5	0.620	Pmax 222°C	positive
5(17)	4.191	118.1	0.035	Pmax 225°C	3.142	141.9	0.022	Pmax	negative
6(14)	0.968	283.8	0.003	no Peak	1.06	117.3	0.009	no Peak	negative
7(30)	22.61	3122	0.007	no Peak	32.27	7340	0.004		negative
8(53)	7.733	1660	0.005	Pmax 208°C	4.698	1593	0.003	no Peak	negative
9(66)	12880	7857	1.639	Pmax 205°C	1334	5060	0.264	Pmax 284°C	positive
10(20)	5.56	245.8	0.023	Pmax 234°C	4.06	511.8	0.008	Pmax 185°C	negative
11(48)	428.2	335.9	1.275	Pmax 205°C	472.2	389.1	1.214	Pmax 208°C	positive
12(36)	6.956	140.6	0.049		25.55	584.9	0.044		positive
13(22)	16220	996.4	16.279	Pmax 208°C	2173	1494	1.454	Pmax 208°C	positive
14(2)	123.6	3399	0.036	Pmax 222°C	298.6	6733	0.044	Pmax 222°C	negative
15(55)	62.41	6309	0.010	no Peak	36	7573	0.005	no Peak	negative
16(46)	51.09	5981	0.009	no Peak	44.75	4962	0.009	no Peak	negative
17(28)	38.22	6894	0.006	no Peak	35.44	2878	0.012	no Peak	negative
18(37)	3286	2747	1.196	Pmax 228°C	6710	5400	1.243	Pmax 218°C	positive

Table C.97 TL data for TL laboratory 24

APPENDIX D

SAMPLE ALLOCATION

Pot order	Lab no
1	27
2	9
3	7
4	21
5	19
6	20
7	14
8	2
9	15
10	3
11	11
12	5
13	35
14	10
15	8
16	4
17	28
18	34
19	22
20	6
21	16
22	25
23	24
24	26
25	17
26	23
27	29
28	12
29	33
30	32
31	1
32	30
33	18
34	31
35	13

Table D1. Allocation of pots to laboratories for round 2 – 35 sets of materials were prepared although only 30 laboratories returned data

SP Number	Serial Number	Sample no
8512 u	1	67
8512 i	2	47
8513 u	3	31
8513 i	4	26
8514 u	5	56
8514 i	6	64
8515 u	7	42
8515 i	8	35
8516 u	9	25
8516 i	10	18
8517 u	11	58
8517 i	12	5
8518 u	13	54
8518 i	14	33
8519 u	15	39
8519 i	16	24
8520 u	17	68
8520 i	18	69
8521 u	19	3
8521 i	20	38
8523 u	21	12
8523 i	22	32
8525 u	23	1
8525 i	24	8
8526 u	25	59
8526 i	26	50
8528 u	27	10
8528 i	28	62
8529 u	29	11
8529 i	30	51
8530 u	31	23
8530 i	32	21
8531 u	33	29
8531 i	34	45
8531 b	35	72
8532 u	36	27
8532 i	37	49
8533 u	38	14
8533 i	39	15
8533 b	40	17
8534 u	41	4
8534 i	42	65
8535 u	43	53
8535 i	44	66
8535 b	45	30
8536 u	46	19
8536 i	47	44
8538 u	48	61
8538 i	49	16
8539 u	50	20
8539 i	51	48

8539 b	52	36
8571 u	53	9
8571 i	54	34
8572 u	55	6
8572 i	56	41
8573 u	57	60
8573 i	58	7
8574 u	59	70
8574 i	60	40
8575 u	61	71
8575 i	62	63
8576 u	63	13
8576 i	64	52
8577 u	65	55
8577 i	66	22
8577 b	67	2
8578 u	68	28
8578 i	69	37
8578 b	70	46
8579 u	71	57
8579 i	72	43

Table D2. Correspondence between SP number and sample number as presented to participants

APPENDIX E

MIXING THE BLENDS

Mixing the Green Tea

On 25 April 2006 499.5g of unirradiated green tea powder was taken from pots 181-200 and supplementary pots 95-97 and part of 98. 0.5014g was taken evenly from irradiated pots 101-110. The material was placed in a 3l plastic mixing bowl and mixed for 60s with Braun Quattro Multimix cakebeaters at the lowest speed to minimise dust generation. After 60s, approximately 3g of material was placed in each of 10 petri dishes, taking the material from different parts of the bowl. The aliquots were screened following the normal PSL procedure as run MIXGT. After measurement, mean SD and CV were tabulated and the cycle repeated for a total of 6 cycles, tabulated below.

Cycle	1	2	3	4	5	6
Aliquot						
1	487	395	386	607	541	555
2	480	506	380	508	761	389
3	391	529	677	427	391	549
4	350	515	376	586	605	553
5	502	608	466	578	549	473
6	634	520	406	322	495	886
7	580	509	478	338	623	335
8	509	1473	483	605	662	638
9	375	485	454	441	577	555
10	492	448	490	506	708	505
Mean	480	599	460	492	591	544
SD	89	312	89	107	107	149
CV(%)	19	52	19	22	18	27

Table E.1 PSL measurements during mixing for SP8578 Green Tea

It can be seen that the signals recorded are smaller than predicted, but that the criterion for CV <50% has been met.

On 28 April 2006 the material was potted for the participants, using 8g per pot.

Mixing the Chilli Powder

On 26 April 2006 the same process was repeated for the chilli powder using 499.5g unirradiated and 0.5329g irradiated. Pots 181-195 were used for the unirradiated material and 101-110 for the spike.

Cycle	1	2	3	4	5	6
Aliquot						
1	587	839	810	725	908	1345
2	831	690	595	1135	1401	585
3	1165	1036	747	664	932	1480
4	810	710	2563	779	530	772
5	1039	1093	764	666	957	552
6	615	837	521	1496	852	797

7	735	818	1464	1069	1249	581
8	4209	1121	1850	1251	810	1390
9	1189	496	671	599	2245	2310
10	1296	843	758	595	897	695
Mean	1248	848	1074	898	1078	1051
SD	1014	184	636	300	449	541
CV(%)	81	22	59	33	42	51

Table E.2 PSL measurements during mixing for SP8535 Chilli Powder

Mixing of Ginger

On 26 April 2006 the same process was repeated for the ginger powder using 385g unirradiated and 3.9003g irradiated. Pots 181-195 and 93-100 were used for the unirradiated material and 101-110 for the spike. It was realised that this is the incorrect concentration for this product. Therefore on 27 April 2006 a further 38.9g of irradiated ginger were added, making a total og 42.8g of spike in 427.8g of blended material, i.e. 10%.

Results of 1% mixing were as follows:

Cycle	1	2	3	4	5	6
Aliquot						
1	4467	3011	4422	1980	2872	3217
2	1838	2299	1237	1959	1093	1459
3	5257	1506	1342	1441	1601	1179
4	1077	987	1309	1760	894	1606
5	1577	1704	3162	1417	1632	1090
6	6277	6662	4130	4664	2237	742
7	2007	1550	7523	1887	4414	2558
8	1644	1625	1796	1607	2761	1311
9	1507	4566	3929	2811	2785	4570
10	2533	1246	2020	3755	17750	1405
Mean	2818	2516	3087	2328	3804	1914
SD	1826	1796	1992	1087	5008	1187
CV(%)	65	71	65	47	132	62

Table E.3 PSL measurements during mixing for SP8531 Ginger 1%

Results of 10% mixing were as follows (from cycle 5 onwards a spoon was used to mix the contents of the petri dishes back into the mix):

Cycle	1	2	3	4	5	6
Aliquot						
1	132317	18631	29131	25373	20460	29978
2	46022	23256	32118	36264	34870	28036
3	29889	40510	30521	24243	27006	27769
4	21053	35030	49456	15367	55175	20575
5	24754	26736	20096	28848	20363	23216
6	49485	29598	41336	16371	30578	45810
7	18082	21613	36341	41747	35186	111396
8	33840	23609	17719	39367	37860	24200

9	23358	15398	45279	91130	34371	24200
10	17763	29798	19610	25919	63566	31277
Mean	39656	26418	32161	34463	35944	36646
SD	34369	7582	11037	21795	13872	27175
CV(%)	87	29	34	63	39	74

Table E.4 PSL measurements during mixing for SP8531 Ginger 10%

After a further 60s mixing, approximately 7g of blended ginger (calculated from the total required for participants and for homogeneity testing) was dispensed into pots.

Mixing the Siberian Ginseng

On 27 April 2006 the above process was used to mix and check a 1% blend of Siberian Ginseng. Pots 181-200 plus 93-95 were used to provide 495.1g of unirradiated material which was spiked with 5.0734g of irradiated material from pots 101-110. During the measurement cycle the decision was taken to perform 6 cycles of mixing and screening regardless of the CV obtained for statistical comparability.

PSL results were as follows:

Cycle	1	2	3	4	5	6
Aliquot						
1	13987	11029	12201	10701	9176	23521
2	8723	9404	10947	8897	8115	17382
3	9143	10991	17336	15057	19073	13751
4	8166	10827	11663	11359	10624	32622
5	16160	11439	12326	9979	8527	12156
6	10562	13188	7280	13235	17283	10343
7	8793	19298	39537	12460	10901	8482
8	10170	8515	11398	9932	15523	14210
9	15319	14326	16974	7769	8834	9218
10	10312	12158	14070	12908	14864	23494
Mean	11134	12118	15373	11230	12292	16518
SD	2923	3028	8982	2210	4027	7787
CV(%)	26	25	58	20	33	47

Table E.5 PSL measurements during mixing for SP8577 Ginseng

On 28 April 2006 the blended material was dispensed into 50 pots for TL and PSL, with 8g per pot. Allocation of pots for PSL followed the same sequence as the ginger.

Mixing the rosemary

The same process was followed on 28 April with the rosemary, to make a 1% blend. 409g of unirradiated material was taken from pots 93-100 and 181-200, and mixed with 4.1791g spike from pots 101-110 to give 413g blend. PSL results are tabulated below:

Cycle	1	2	3	4	5	6
Aliquot						
1	540	2299	1800	66252	846	657
2	1516	2533	1256	403	857	529
3	1072	1604	1047	817	882	1517
4	892	1901	1191	983	967	1329
5	1499	769	766	2751	1319	1968
6	557	636	340	500	785	1375
7	887	964	1523	825	1447	1188
8	461	885	1251	1139	1889	1135
9	1214	581	792	2198	922	844
10	1979	637	710	762	959	396
Mean	1062	1281	1068	7663	1087	1094
SD	495	740	429	20600	354	488
CV(%)	47	58	40	269	33	45

Table E.6 PSL measurements during mixing for SP8533 Rosemary

6g of blended material was put into each of 50 tubs as before.

Mixing the tarragon

The same process was followed on 28 April 2006 with tarragon, using 324g from pots 93-100 and 181-200 and 36.2g of spike from pots 101-110. to give a blended weight of 360.2g.

PSL results are tabulated below:

Cycle	1	2	3	4	5	6
Aliquot						
1	1585	6275	3232	2294	1565	5185
2	725	1616	2258	1958	943	2697
3	6505	4374	8500	2596	2538	1943
4	2111	2410	1644	4576	1636	2966
5	2643	6820	3393	5427	1703	4320
6	6120	3403	2008	2202	2077	1495
7	1311	6345	5141	1434	10127	1852
8	1926	3583	1911	3411	1786	2164
9	4635	3002	6089	2059	5335	1345
10	1459	4553	2364	2268	2329	1444
Mean	2902	4238	3654	2823	3004	2541
SD	2084	1771	2243	1269	2770	1294
CV(%)	72	42	61	45	92	51

Table E.7 PSL measurements during mixing for SP8539 Tarragon

On 2 May 2006 the chilli powder and tarragon were potted (8g and 6g per pot respectively).